Journal of the Society of Arts.

FRIDAY, FEBRUARY 29, 1856.

ELEVENTH ORDINARY MEETING.

Wednesday, February 27, 1856.

The Eleventh Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 27th instant, George Moffatt, Esq., M.P., Vice-President, in the chair.

The following Candidates were balloted for and duly elected Ordinary Members:—

Baker, Robert.
Boucher, John.
Brassey, Thomas.
Callaghan, William.
Chater, Henry.
Chater, Joseph.
Dupré, John.
Houghton, George.
Lindsay, William Schaw, M.P.
Liardet, Capt. Francis, R.N.
Lye, John.
Obbard, Robert.
Robertson, Robert William.
Saxby John.
Scratchley, Arthur.
Shaw, William Edward, F.R.G.S.
Shearer, Bettesworth Pitt.

The paper read was

ON SOME OF THE ANIMAL AND VEGETABLE PRODUCTS CONSTITUTING THE FOREIGN COMMERCE OF LIVERPOOL.

By Thomas C. Archer.

In attempting to select from the vast list of vegetable and animal products imported into Liverpool, a few upon which to engage your attention, my chief difficulty arises from the multiplicity of objects which present themselves, each vying with the others in importance, and rendering it no easy task to choose which shall be the subjects of my paper.

I am led to think that the most useful course I can adopt will be to leave the great staple imports, about which information is easily obtained, and content myself with bringing under your notice other articles which are not so generally known, and do not, like tea and sugar, form matters of general consumption. I will also, without offending I hope, point out as I proceed some inaccuracies which a fellow-worker in this field has brought forward, inadvertently I am sure, in some papers he has read before this Society.

For convenience I will arrange the subjects of my communication under the following heads:—

(*a.*) Vegetable—1st. Alimentary substances; 2nd. Dyeing and tanning materials; 3rd. Materials used in various manufactures; 4th. Materia medica.

(*b.*) Animal substances.

Of the alimentary substances which have lately been imported, and which either have become, or might be beneficially made, regular articles of consumption, we have first the seed of a grass, *Glyceria fluitans* (R. Br.) the *Festuca fluitans* of Linnæus. This plant is a native of Britain, and is found abundantly in shallow stagnant waters and slowly running streams; although a most abundant bearer, the seeds are never collected in this country, but in Russia, the collection of the seeds is an important branch of industry. The mode of obtaining this grain is curious; the peasant takes an old felt-hat, and, wading in the water, skims the hat amongst the patches of *glyceria*: when the grain is ripe, the seeds fall into the hat, and in this manner are saved. I do not know the process used by the Russians for husking this grain, but they accomplish it very completely, and generally granulate it, in which state it resembles *Semolina*, and is called *Manna* or *Manna Croup*. Most of the vessels from the Russian Baltic ports bring small quantities, generally as presents, belonging to the captains; it is quite equal to the Indian Soojee, or the Italian Semolina. It is occasionally imported in another form, called *gritz;* in this state it is simply the fruit, or caryopsis, denuded of its covering. In both forms it is an excellent diet article, especially for children.

Large quantities of another graminaceous seed have also been frequently imported of late under the names of darra, durra, Persian grain, and minnot seed; it is the fruit of the broom corn, *Andropogon Sorghum*, (called broom corn because its stems form the material of which carpet-brooms and whisks are made). The imports of this grain for the last five years have averaged about 300 quarters. It is stated that the only application of durra is that of serving as food for poultry, but there are strong suspicions that poultry are not the only two-legged animals which feed upon this grain.

Several leguminous seeds have lately become known in our port; the most valuable is the seed of *Cicer arietinum*, the chick-pea, or Ceci, which is ground and used the same as pea-meal, than which it is, in all probability, more valuable; we usually received it from Turkey, but its native country appears to be India, where it is called gram, chuna, and dholl or dhall. It resembles in appearance some of the finer varieties of our garden peas. Not more than 200 quarters have been imported in the last five years. The nutritive qualities of this pulse are said to be remarkable, the Arabs often sustaining themselves through several days' journey upon a small bag of roasted dhall, which they slowly masticate whilst travelling. It is very extensively used through a great portion of the peninsula of India, as food for the poorer classes, and also for cattle, for both of which purposes it is occasionally roasted.

I gave the name of gram, amongst others, to the chick pea, but it must not be supposed that this article is always meant when that name is used, for the natives of India apply the term gram to several species of leguminous seeds, chiefly belonging to the genera *Phaseolus* and *Dolichos*.

Egyptian and French lentils are also occasionally imported, the former in considerable quantities, the latter only rarely, and in small parcels, chiefly for private use in the manufacture of soups, for which they are deservedly esteemed by the French. Both are the produce of the same species, *Ervum lens*, but superior culture has caused those from France to be more than double the size of the others, which are also darker in colour. Egyptian lentils are used for a variety of purposes, particularly in the manufacture of the empirical article called "Revalenta Arabica;" they are also used in soups.

Of the *feculas* or starches of commerce, we receive only a small quantity, if I except sago and the various forms of Mandioca starch and meal. The greatly increased Indian trade of the port of Liverpool has caused large importations of sago; and the intimate relations which have always existed between the Liverpool and Brazilian commercial establishments, have caused considerable importations of tapioca, cassava powder, and Mandioca meal, or farina, as it is most frequently called.

These substances, according to the best authorities,* are all produced, by different processes, from either of the two species used, viz.:—The Bitter Cassava, *Manihot utilissima* (Pohl), and the Sweet Cassava, *Manihot Aipi* (Pohl); the latter is not poisonous in its recent state.

The sweet cassava has been imported in very small quantities, in the form of small circular slices of the root, but no application has been found for them in this country.

The root of the bitter cassava is that chiefly used; it is a large, thick, fleshy tuber, internally of a yellowish

* Pereira and Pohl. Plant: Brasil: Icones et Descrip. 1827-31. Also Dr. Shier. Report on the Starch-producing Plants of British Guiana.

white colour; the plant is an evergreen shrub, about three feet in height, and occupies about two square yards of surface. It is a native of Brazil, and is very largely cultivated throughout the greater part of South America, where it constitutes the staple food of the various nations and tribes, both of the civilised and savage populations.

Mandioca meal, or farina, is prepared by rasping the large fleshy tubers upon wooden rasps of considerable size and of great hardness; specimens of these implements may be seen in the admirable Museum of Economic Botany at Kew. The soft pulpy mass is then put into a curious long bag, called a *tipitis*, made of strips from the stem or petioles of a palm; they are so plaited that when the handles placed at the ends are pulled, the *tipitis* stretches out in length but contracts in girth; the pulp is thus compressed, and the poisonous juice is squeezed out. This juice is boiled to the consistency of treacle, and then constitutes a delicious sauce, called cassareep, which has lost every trace of its poisonous property, and is so powerfully antiseptic that it preserves animal food for a great length of time, even in the tropics. When this juice is pressed out, the comparatively dry pulp is then washed in cold water as long as the water is rendered milky; the whitened water is then put aside for a time, and the starch subsides. This starch is then spread upon the bottom of a large shallow pan over a slow wood fire, and whilst drying it is frequently stirred. The heat destroys any trace of the poison which might otherwise remain, and at the same time it converts a portion of the starch into soluble dextrine, which agglutinates the mass, and gives it that broken rocky appearance so familiar to us in the tapioca of commerce, which is thus made. The bulk of the pulp has not been taken up by the water and is very useful, a considerable portion of the starch still remaining in the unbroken cells; it is therefore slowly dried, with very slight heat, and constitutes the farina, or Mandioca meal, which is to the Brazilian what the meal of grain is to Europeans. The cassava bread on the table is made from this meal; but the cassava powder or flour is the starch washed out of the roots of sweet cassava, which, as the plant is not poisonous, does not require the application of heat to remove the noxious properties; this fecula consequently resembles other pure starches.

Mr. P. L. Simmonds, in his paper "On New Farinas and Starches,"* states that "the green bitter cassava, when properly cultivated, will yield 25 tons to the acre, and this will give one-fifth of its weight in starch. Five tons of starch at, say, 6d. the pound, would give £56 per acre. Such a return as this would enable the West India colonies to inundate Great Britain with food, and at a rate which would make flour be considered a luxury. The meal of the cassava is in extensive use all through Africa and the Antilles, and is almost the only kind of farina used in Brazil. It is the *moussache* of the French colonists, and sometimes comes into commerce under the name of Brazilian arrowroot."

There are some errors in this statement, which I hope Mr. Simmonds will forgive me for pointing out. The first is, the incredible quantity which he has given as the produce of an acre of well cultivated cassava, and more especially the large amount of fecula, which he states at 5 tons.

I presume it is sufficiently well known that we are indebted to Dr. John Shier for the most perfect information respecting the cultivation, preparation, and produce of the cassava plant. Dr. Shier thoroughly investigated these important particulars, not from books or hearsay, but by absolute practice on the soil of South America; and he says, "If an acre of well-tilled, thorough-drained land yields 10 *tons of fresh roots*, and I have every reason to believe that such a return might be obtained, I have ascertained that the produce would be 3½ *tons of meal*, 593 lbs. of cassareep, and 2 *cwt. of starch*; and estimating the meal at 1d. per lb., the cassareep at 1s. 5d. per lb., and the starch at 40s. per cwt., the gross amount would be £78 13s. 4d. per acre." Whereas, according to Mr. Simmonds, if we add the value of the cassareep and meal to the starch, the value would be about £130. Another mistake that gentleman has fallen into, is in confounding the Mandioca or cassava *meal* with the Brazilian arrowroot, which is the cassava powder or starch, made by simply washing the sliced and bruised root of the sweet cassava.

The Mandioca meal is very largely imported into Liverpool, whence it is forwarded to Manchester, and other places, to be used as a starch for stiffening cotton goods. We also receive very large quantities of sago flour from India, which is used for the same purpose; it is the starch or sago washed out from the pith of the stems of the sago palms, but it does not undergo the curious process of *pearling* or *granulating*, which is applied to the sago intended for food.

Further on in the same paper, Mr. Simmonds alludes to another article which has lately been frequently introduced into Liverpool, I mean salep, which consists of the *tubers* of one or more species of terrestrial orchidaceous plants; but Mr. Simmonds calls salep a fecula. Thus he says, "The manner in which *salep* has been cheapened by the introduction *of other equally useful feculas*, shows the importance of greater attention to this profitable branch of tropical culture." Now, though containing some starch, salep is not, correctly speaking, a starch or fecula; its chief value arises from its forming an excellent nutritious diet drink. It is, however, now rarely used for this purpose, and I should have been much puzzled at the importation not only continuing, but also increasing, had I not traced a lot of this root to the manufactory of a chocolate maker, from which I presume that it is occasionally employed in that preparation.

My grounds for such a supposition are, I must confess, very slight, but, whether I am right or wrong, I am persuaded salep might be very advantageously employed in the manufacture of cocoa and chocolate. The very best salep is that yielded by our commonest indigenous orchid (*Orchis mascula*), which is very abundant in most parts of England. I have received lately, from my friend Dr. Theodore Martius, of Erlangen, a very fine sample of salep, prepared in Germany. It is far superior to the Indian salep, which is, in all probability, derived from plants growing in the most northern parts of Asia, probably species of *Orchis* and *Eulophia*.

I may here mention another article used by the chocolate makers, and very eagerly sought by them, it is the so-called "sassafras nuts," or *puchury beans*, which are in reality the seed lobes or cotyledons of the seeds of *Nectandra puchury*. They are valued for the peculiar flavour which they impart.

An article used for making a common Brazilian diet drink is often imported in small quantities, chiefly, if not altogether, for private use. It is called *Maté*, and in most parts of South America is a highly esteemed beverage. It consists of the leaves and young shoots of the Paraguay holly (*Ilex Paraguayensis*), broken up very small. An infusion is made of this material, which is handed round the table, and each person draws up a portion through a small curiously-formed tube, called a *bombilio* (from its having a small perforated bulb at the end to act as a strainer), usually of silver. I have been informed by some that this beverage is slightly intoxicating, but others of whom I have inquired have asserted that such is not the case. I shall set this question at rest by trying it with the first fresh sample I can procure. Those who have been accustomed to *maté* speak very highly of its cheering and invigorating effects; and if it should be found agreeable to the European palate, there is no doubt that an abundant supply could be obtained at a cheap rate.

Some fruits which are imported into Liverpool are very interesting, thus we now have the beautiful and delicately flavoured *Litchi* (the fruit of *Nephelium Litchi*), commonly imported and sold in our market. We also occasionally see the variety of orange called the Navel orange, of Brazil, which, when in good condition, is remarkably de-

* Vide *Journal of the Society of Arts*, Vol. III., page 774.

licious; the little oranges with highly perfumed rind, called *Tangerine* oranges, and in a preserved state the Mandarin oranges of China (*Citrus nobilis*), and the Cumquat (probably *Citrus margarita*), also Chinese. I have also once seen the curious little "lime-berry" of Manilla and the Coromadel coast, (it is the fruit of *Glycosmis arborea*) not larger than a small grape; it has all the rich flavour of the lime, and the brilliant colour of the cherry; it is, however, mixed with a yellow variety equally pretty. Frequently in summer we have the large fruit of *Opuntia vulgaris* and *Opuntia tuna*, called prickly pears, or Indian figs, added to the variety of our fruit shops; they are imported from the South of Europe, where they are naturalised and cultivated. Once or twice lately importations of the Loquat, or apple-like fruit of the *Eriobotrya Japonica* have been received and sold, but their novelty and pretty appearance were their only recommendations; they came from the Azores, where they are cultivated. Of the walnut tribe we have several interesting species amongst our imports, and generally purchasable in the shops; thus the Pecan nut (usually from New Orleans), the fruit of *Carya olivæformis* and the Hickory nut (*Carya Alba* and *Carya Sulcata* often mixed), from North America generally. From Canada we receive the Hog nut (*Juglans porcina*) and the black walnut (*Juglans nigra*), but very rarely.

From Brazil we receive two nuts, one the well-known fruit of *Bertholletia excelsa*—called in London Brazil nut; in Liverpool, equally well-known as the Para nut and Castanha nut; of this the quantity imported is very large, amounting often to more than 20,000 bushels in one year. The other is the Sapucaia nut, which is highly prized for its superior delicacy; it is the produce of a large tree (*Lecythis ollaria*) closely allied to the one last mentioned. The Sapucaia nut is not a common import.

The Demerara or butter nut, called also *Souari* and sometimes *Suwarrow nut*, is occasionally received in small parcels, and commands a good price, usually about one shilling per pound, notwithstanding the enormous thickness and weight of the shells. It is the fruit of *Caryoar butyrosum*, and possibly other species of the same genus; the kernels are, unquestionably, the most delicious of all the edible nuts. Within the last three years, the fruit of a South American palm (the *Jubœa spectabilis* of the Kew Gardens) has been added to our imports, and considerable quantities have been received; they are small and round, about the size of a walnut, with a smooth ash-coloured shell, and hard indigestible kernel, with a cocoa nut flavour. They are sold under the captivating name of "little coker-nuts."

I must now draw my account of the alimentary substances to a close, and proceed with those used in dyeing and tanning. Liverpool commerce embraces a very large receipt of all the common dyeing and tanning substances, but I shall content myself with mentioning only two or three of the more interesting ones. Perhaps the most remarkable is the myrobalan, called generally by commercial men "myrabbolam." Twelve or thirteen years since, it was scarcely known in Great Britain, but last year the imports of Liverpool amounted to the very large quantity of 680 tons.

It is impossible to obtain the correct statistics of this article, for, owing to its taking the place, to a considerable extent, of galls in dyeing, it has been very frequently returned as *galls*. The myrobalan is also a very useful tanning material. It is the fruit of *Terminalia chebula*, and, I think, is usually gathered unripe, because it has a wrinkled surface generally; but in large lots many specimens may be found which are very plump and free from wrinkles; they are also double the usual size; I conclude these are the ripe fruit.

For similar purposes we have received one or two small lots of the seeds of *Hernandia ovigera*, from India; they were imported under the name of Hernant seeds. The bark of a species of oak, under the name of Quercitron bark, finds its way to Liverpool from the United States in very large quantities; it is the produce of *Quercus tinctoria*. This bark is crushed, and consists of loose short fibres and dust; it is extensively used in dyeing and tanning processes.

Under the third head I will mention the seeds used for expressing oil, which have, within the last few years, increased to a very great extent; they are chiefly from the East Indies.

Sessamum, or gingellie seed, the produce of *Sessamum orientale*, was unknown in Liverpool fourteen years since, but it is now a staple import, amounting to several thousand quarters per annum; the oil is also finding its way both to the Liverpool and London markets. Another seed, called Niger seed (*Verbesina sativa*), was introduced about the same time, and has kept pace with the gingellie seed.

Safflower seed (*Carthamus tinctorius*) is now coming in considerable quantities, and yields a very fine oil, equal to that of olives for many purposes; and thousands of quarters of seed, the produce of two or three species of mustard, are also sent annually from India, under the name of surzee seed, for crushing in the oil mills. The nuts of the acrid Euphorbiaceous plant, *Jatropha curcas*, the physic nut of the West Indies, is also occasionally imported, and owing to their drastic properties have occasioned much mischief to children and others who have been led to taste them on the quays; but the oil of these seeds is very largely imported under the name of "seed oil," this indefinite name having been adopted for the purpose of concealing the origin of the oil. It is expressed at Lisbon, and until lately was chiefly employed for the public lamps of that city. In this country the cloth workers of Yorkshire find it very useful, and cheaper than olive oil. The seeds are common through the West Indies, but Lisbon is said to be supplied from the Cape de Verd islands. It is an admirable burning oil, and I have no doubt it could be supplied in very large quantities from the West Indies and British Guiana, if attention were properly directed towards it. At present the Liverpool trade in this article is all in the hands of one firm, who are reaping a handsome profit from the importation.

The ground nut (*Arachis hypogœa*) occasionally comes in considerable quantities from the West Coast of Africa, and is used for expressing oil. This oil congeals at a comparatively high temperature.

The newest addition to our oil seeds is the produce of a leguminous plant (*Psoralea corylifolia*) from the East Indies; it was imported for the first time, I believe, this month, under its native name, *Bawchee seed;* its qualities are not known at present, as it has not yet been tested.

The Chinese are said to prepare a valuable painters' oil from a large pea. I do not know the particular plant, but I have a specimen of the oil, and it appears fully to warrant the praise which has been awarded to it.

Of fibrous materials I cannot say much which is satisfactory. Science has pointed the way, but it is no easy matter to drive, or even tempt, mercantile men out of the beaten track; the consequence is, that notwithstanding all which has been said and done respecting the discovery of new fibres, little has been done towards their introduction. We have had a few lots of the China grass (*Böehmeria nivea*), but they were very long on hand. A beautiful fibre was imported in 1854, purporting to be pine-apple fibre from Manilla. I believe it is still on sale. Sir William Hooker kindly examined it for me, and decided that it was not common pine-apple fibre, though possibly it may be, and probably is, the produce of some species of Bromeliaceous plant. Another curious and promising fibre, resembling green wool, came from Brazil, under the name of Tecum, the produce of a palm-leaf; like the last, it met with no purchaser. The trade in the curious palm fibre called piassava or piaçaba, is considerable, amounting to 80 or 100 tons per annum. These singularly rounded fibres are the produce of two species of palm,—one kind, which is very coarse, comes from Ceara, the other, and better kind is from Para; both are

the result of the same peculiarity in the palm tribe, namely, the tendency of the fibres of the petioles, or leaf stalks, to split into long round threads as the leaf dies away. The use of this material in making street brooms is well known. Another application, perhaps, is not so generally known, I allude to the employment of the smaller fibres for the purpose of mixing with bristles in the manufacture of cheap brushes.

We have received two sea-weeds from the island of Ceylon; one, called Agar agar, yields a thick jelly, which has been found useful in dressing cheap silks; it is the *Fucus spinosus*. The other is the *Plocaria candida*, or true Ceylon moss, and it has been found useless.

Of the gums of commerce we receive a considerable number, but so important a subject cannot well be treated as part of a paper; I shall, therefore, only allude to three. The first is gum arabic, of which we receive a small quantity only; so small, indeed, that I began to question the accuracy of Mr. P. L. Simmonds' assertion, that the imports (general) were 3,000 tons per annum. I find that the imports of 1854, under the head of gum arabic, were 2,022 tons, but it must be remembered that all gums resembling gum arabic, such as gum Senegal, and many others, are classified under this head, owing to the difficulty of telling one from another; but a moment's glance at the names of the countries from whence they come, is quite sufficient to show that they are the produce of different species of plants.

Gum copal reaches us from Western Africa in very large quantities; it is generally thought to be yielded by some species of Hymenæa, but, I believe, nothing positive is known concerning its origin. Large importations of the Kawrie gum of New Zealand have also taken place; this appears to be a true resin, and is said to be found always buried in the ground usually where forests have been burned. It has been attributed to a species of Dammara.

In the imports of materia medica nothing is more conspicuous than the enormous increase of nux vomica. Ten years since a ton of this article would have been a large annual import—it now sometimes exceeds a hundred tons. Its use in medicine will not account for this large increase, and our sanitary officers will do well to make observations upon the symptoms which attend the dying ale-drinker, for notwithstanding the fine testimonials of the recipients of casks of pale and bitter ales, my firm conviction is, that the pure bitter of strychnine is a valuable auxiliary to the brewer. Great efforts were made a few years since to introduce the wood of *Picrena excelsa*, a large tree producing a wood as intensely bitter as quassia, and, indeed, this wood was supposed by the importers to be quassia, but they entered it as *billet wood*, in order to evade the duty. The trick was eventually discovered, and this, together with the high rate of duty, has prevented the brewers receiving their supply of bitter wood. They have, doubtless, found a substitute.

The animal products which I propose to notice are very few. The most curious was a large importation of hyraceum, the singular production of the *Hyrax capensis*, or Cape Hyrax. It is not known whether it is the thickened urine, or some other secretion of the animal; it is found in the cavities of the rocks it frequents, and the importation I have mentioned consisted of several tons, intended to be used as guano, although it was originally introduced as a substitute for the costly Castor. That which was imported for manure was much mixed with sandstone, which greatly added to its bulk and weight.

Brazilian isinglass is becoming a very important article of commerce. Our imports are annually increasing, but we do not know satisfactorily from what fishes the material is derived. The examination of some hundreds of cases has led me to believe that the Brazilian isinglass is yielded by several species. The dried albumen of eggs, which was first received in 1851, has been imported from Havre, but I do not know for what purpose, I only know it was forwarded to some print works at Manchester.

Hippopotamus teeth are imported from time to time as sea-morse teeth; they are eagerly purchased by the dentists for artificial teeth. And beautiful articles are made from the so-called horn of another *Pachyderm*, the rhinoceros; this horn consists of compressed hair, and is in fact the whole hair of the animal condensed upon one point. Out of these quasi-horns the Ceylonese manufacture many pretty ornamental articles, such as vases, cornucopeias, &c. Once, and once only, have I seen an importation of trepang or sea-slug. It was one parcel imported by a Manilla lady, for her own especial delectation; but her husband, an Englishman, found it out, and sent it to me, begging as a favour that I would keep it, as he had a perfect horror of this Malayan *bon-bouche*. I gladly accepted of it, and it has enabled me to present specimens to the Trade Museum, and many other institutions, and to show them on the present occasion.

Since writing the above, a new importation has added another rare tropical fruit to the list of our dessert fruits; it is the Longan (*Nephelium longanum*), which has for the first time arrived at Liverpool within the last week; it is also of the same genus as the Litchi.

I also should have mentioned the seeds called marking nuts (*Semecarpus anacardium*), belonging to the same natural order as the common Cashew-nut, which is not unfrequently imported under various names. The last consignment, still in the port, was called Marany nuts. It contains, besides the kernel, a large proportion of a black acrid secretion, which is said to be used as varnish. I cannot, however, ascertain its destination, and should feel obliged to any member for information upon this subject.

SOME REMARKS ON MR. ARCHER'S PAPER.

By P. L. Simmonds.

[The Secretary having, at Mr. Archer's request, forwarded a copy of the foregoing paper to Mr. Simmonds, has received the following observations from him.]

Looking at the vast extent of the trade of Liverpool, the greatly superior amount of its tonnage compared with other British ports, and the interesting character of the products with which it carries on the greatest amount of trade, individually, I must acknowledge myself somewhat disappointed at the limited list of new products or possible articles of commerce which Mr. Archer has been able to bring before the notice of our Society.

The commercial advance of Liverpool is one of the wonders of the age, for in the last ten years it has doubled the amount of the shipping owned at the port, which now approximates to 1,000 vessels, registering nearly 1,000,000 tons, being 250,000 tons in excess of the port of London, and one-fourth of the whole tonnage of the United Kingdom. The tonnage entering at that port in 1854, from foreign and colonial ports, numbered 4,500 vessels, measuring nearly 2,250,000 tons, exclusive of its vast coasting trade.

The extent of the entire tonnage of Liverpool, inward and outward, in 1854, reached the enormous total of 7,675,689 tons, while that of London, with double the amount of coasting trade, was only 8,495,463 tons.

With a smaller amount of foreign tonnage, the commercial novelties reaching London year by year are, however, very numerous.

Cottons, wools, sugars, and grains from new quarters; new furniture and dye woods, new fibres and oils, new drugs, new succades and dried fruits, minerals from new quarters; on all these, although some indeed form "matters of general consumption," detailed information is greatly desired.

The important quarters to which the commerce of Liverpool is directed, North and South America, Central America, Australia, Africa, and latterly India, and the Pacific, would have led to the supposition that many novel products must have been introduced, and I had anticipated a large amount of new information respecting

special articles that might have come into Liverpool incidentally from those quarters during the last few years.

The absence of a greater number must, I presume, be owing to a want of enterprise on the part of the Liverpool brokers and merchants in seeking out new products, rather than to any lack of industry or research on the part of Mr. Archer. That gentleman has possessed extraordinary facilities for examination and investigation of late years—as the collector of the imports of Liverpool shown at the Great Exhibition in 1851—as collector of specimens for the present Crystal Palace at Sydenham, for the British Association for the Advancement of Science, and as a Lecturer on these subjects at the Scientific Institutions at Liverpool, as well as from his connection with the Customs.

We are, nevertheless, much indebted to him for the varied information which he has brought forward this evening. While setting myself right on those points which he has called into question, I trust I may be permitted to supplement my quota of information on the different articles he has touched upon, especially as his paper is rather short.

The dhurra, of which Mr. Archer speaks, the *Androphogon Sorghum*, of Roxburgh, is not unlike the great Indian millet, the Guinea corn of the East and West Indies (*Sorghum vulgare*).

In Egypt only, I believe, it is known as dhurra; and we import large quantities from the Levant, in some years 20,000 to 40,000 quarters, which are sold in Mark-lane, not for poultry, but for human food. In India the Hindoostanee name is jowaree, and the Tamil name cholum. The grain, which in India is about the size of white mustard seed, is, according to Col. Sykes, sweet, palatable, and nutritive, and held in high estimation as the general food of those of the lower orders of India who do not inhabit the mountainous or jungly tracts. Although less rich in protein compounds than maize, or Guinea corn, jowaree is fully equal to many varieties of English wheat. While mentioning wheat, I may incidentally allude to the fact, that considerable imports were shipped to England from Calcutta last year. I have not heard this jowaree before called broom corn. The name broom corn is usually applied to another description of sorghum (*S. saccharatum*).

The urburree, or chenna (*Cicer arietinum*), the chick pea of England, is, as Mr. Archer well remarks, a very valuable pulse, forming in India a part of every farmer's cultivation. The grain is about the size of a marrow-fat pea, and its form is like a ram's head, whence its specific name. Although given to horses, it is also made into puddings and stirabout by the people, and even used as a bread grain, being ground into flour and made into cakes. [Sykes on the Cereals of India.] From the plant exuding oxalic acid, it is used in curries, instead of vinegar. Dhall is not applied to the pulse known as gram, but is the native name for the *Cytisus Cajan*, or *Cajanus flavus* of Decandolle, the pigeon pea of the West Indies, the pulse of which is, in India, the universal substitute for the split pea of Europe.

Mr. Archer seems to doubt the accuracy of my estimates with regard to the produce of cassava. A residence of several years in Jamaica as a planter, and large experience in the culture of that root, and of the other tropical food plants, enables me to reiterate the statement, and to aver that my estimates are rather underrated than overcharged as to the maximum yield. Has Mr. Archer any knowledge of the extent of roots that are even raised in temperate climates per acre? whilst the luxuriant produce of the tropics is widely different. I stated that the cassava, when properly cultivated, will yield 25 tons of root to the acre, and I did this not only from personal knowledge, but also from the very report of Dr. Shier from which Mr. Archer quotes an isolated passage. Dr. Shier was not a *cultivator*, but an agricultural chemist and experimental analyst, in the Laboratory at Georgetown, and I have always been ready to give due weight to his valuable observations and chemical researches. Indeed, the best proof of this is afforded by the large quotations I have made from his report to the Governor of British Guiana, on the starch-producing plants, and the favourable mention of it, in my work.

Dr. Shier, in that report, however, sets out by stating, that he confines himself principally to those matters "capable of being settled in the laboratory. On other points," he adds, "particularly those relating to the returns per acre, I am at present but imperfectly informed, in consequence of the limited extent to which these plants have hitherto been cultivated in this colony (Demerara), and from the total absence of authentic data regarding the amount of yield." However, Dr. Shier adds his conviction, from subsequent inquiries and investigations, that "in thorough-drained land, where the roots could penetrate the soil, and where its permeability would permit of their indefinite expansion, a return of 25 tons of cassava the acre might uniformly be calculated upon!" But this is not a mere opinion; it is borne out by actual results. On an estate at Essequibo, an acre of cassava, grown in fine permeable soil, was lifted and weighed, and it yielded 25 tons.

I am not in the habit of depending upon "books or hearsay," but have had absolute practice on the soil of the West India islands, and am too much engaged as a journalist, in commercial and statistical investigations to make unsupportable assertions or calculations without due consideration, and a thorough knowledge of the subject I am discussing.

And now as to the yield. I only assumed one-fifth. The proportion of starch from the cassava roots averages more than 25 per cent. of their weight, as will be seen by the following analyses given by Dr. Shier:—

	Per Centage of Starch.
Sweet cassava	26·92
Bitter cassava	24·84
Another sample	20·26
	72·02
Average of the three	24·00

The price of the starch will, of course, vary; 9d. a lb. was obtained in Glasgow for some shipped from Demerara, but this must necessarily depend upon the state of the markets, the extent of the demand, and the quality of the prepared article, whether it has been simply washed or undergone repeated purification and bleaching. I did not place any value upon the inspissated juice or cassareep, because it has been found unsaleable here, samples not meeting a purchaser, at least in London, and as for the quaqua or refuse portion, of the fibre left after straining off the starch, it is, for the most part, thrown away as useless, and would not possess much commercial value, unless as food for pigs or calves.

In confirmation of the accuracy of my observations, I may be permitted to quote the following passage from a paper by Dr. Bowerbank, in the September number of the *Transactions of the Jamaica Society of Arts*, page 128, on bitter cassava. He remarks:—

"In the July number of the *Transactions* I attempted to show, from the statements and estimates of Dr. Shier, that the cultivation of the bitter cassava, and the preparation of its various products, both for exportation as also for home consumption, would be highly remunerative. Since writing the above, I have met with the following encouraging confirmation of Dr. Shier's views. It occurs in Mr. Simmonds's work, entitled 'The Commercial Products of the Vegetable Kingdom,' under the section Root Crops, article Cassava," and then he quotes at length my observations.

If my estimates and opinions thus pass unchallenged and meet approval in the colonies themselves, where these plants are well known and cultivated, it is, I think, a sufficient answer to Mr. Archer's *incredibility* as to the produce of root crops and yield of starch. But I may cite, for his further satisfaction, the produce of root crops

in Europe. In Belgium, under good cultivation and a plentiful supply of manure, the produce of beetroot is 24 tons to the acre. In Ireland, owing to the extreme moisture of the climate, the produce varies from 20 to 30 tons per statute acre. Mr. Reeve, of Leatherhead, Surrey, in a paper read before the Royal Agricultural Society of England, in April, 1852, stated that he obtained a yield of 38 tons 16 cwt. of Silesian sugar beet from a heavy clay soil. In some parts of Scotland, 20 tons of potatoes to the acre have been grown.

Mr. Archer corrects my looseness of style in misapplying the terms "meal" and "fecula," but writing hastily and extensively, and principally addressing myself to commercial readers, I may, from adopting the commercial misnomers in general use, be occasionally chemically and scientifically inaccurate, and had I expected to be taken to task for these errors, I should either not have given forth my hasty observations at all, or pondered well my phrases and sentences. My communications to the Society's *Journal*, as the Secretary will confirm, have been usually written on the spur of the moment, when busily occupied with other literary engagements, after some incidental conversation, or in order to supply promptly my mite of information on any topic incidentally started, and appearing to require elucidation.

As to the alleged intoxicating properties of *Paraguay tea*, the Yerba Maté, I think there must be some mistake, although the opinion has been given currency to by the late Professor Johnson, in his "Chemistry of Common Life," but then he admits that no analysis has been made, or much authentic information obtained, as to its influence. No local writer that I have consulted mentions such a property in the beverage, although, unlike the Chinese tea, it is said to deteriorate by keeping. The trade in this holly-leaf to the South American republics must be very large, although no reliable statistics can be obtained, as it is all sent by land carriage from Paraguay.

With respect to the hickory nut, I may mention, on the authority of an American newspaper, that an excellent oil for burning and for machinery has recently been made from it in Ohio. It remains in a fluid state at a low temperature, is used in very delicate machinery, and, when properly refined, might be useful for watchmakers. The pig nut (*Carya porcina*) is preferred in the manufacture on account of its thin shell and greater abundance of oil. It is stated that oil manufactured from the ordinary shell-bark, and large sweet hickory nuts, would come into general use for the table.

Myrabolans.—The imports of this drupe as a tanning and dyeing material into Liverpool are even larger than stated by Mr. Archer. Last year the imports there exceeded 800 tons. They have been more in demand lately, at higher rates, owing to the scarcity of Shumac. A medicinal oil is obtained in India from the kernel of both the *Bellerica* and *Chebula myrabolans*.

Although occasionally used for tanning purposes in India from time immemorial, it is only within the last eight or ten years that they have come extensively into use in this country. The imports fluctuate, and as many as 2,000 tons have been received in some years. In 1853, a sudden commercial demand sprung up for them at Madras, and large profits were made by the persons who collected them in the jungles. As much as 700 tons were exported during the season from that quarter alone, being four times the quantity shipped in the two previous years.

Oil Seeds.—Of the Gingeley there are two or three varieties grown in India,—the black-seeded (*Sesamum orientale*), and a red-seeded variety, erroneously called rape, are the principal.

The plant is extensively cultivated, and the oil obtained from it is perhaps consumed to a greater extent than any other by the natives of India. The seeds yield 40 to 44 per cent. of a very pale straw-coloured, sweet-smelling oil, an excellent substitute for olive oil. It is also used in the East for anointing the person, for making soap, and for burning in lamps. Of 12,580 tons of the seed shipped from Madras in 1853, 636 tons came to England; and of 72,607 gallons of the oil imported from that Presidency, 42,043 gallons were shipped to the United Kingdom.

Safflower seed, also imported into London under the name of Curdee seed, is very similar in appearance to the seeds of the sun-flower, only whiter. The seeds furnish a light yellow clear oil, used for lamps, culinary, and other purposes.

Mustard Seed.—The imports of this so-called seed are largely on the increase from India. In the twelve months ending 1st Nov. last, 1,390,542 Indian maunds were shipped from Calcutta to Great Britain, against 191,264 Indian maunds in the corresponding period of 1854. The Indian maund is equal to 100lbs. troy. In 1853, 804 tons of the seed were shipped from Madras. Five or six species of the plant are cultivated in India, but the two principal are *Sinapis alba* and *Sinapis nigra*. The former yields by expression 36 per cent. of a bright yellow pleasant-tasted edible oil, having a strong smell and slight taste of mustard. The seeds of the latter yield only about 28 per cent. of oil. This valuable oil is used in most parts of India in cooking, and is considered superior to all others for anointing the body, which it is supposed to invigorate.

Large quantities of *Poppy seed* are now coming forward from India, and the imports last year were considerable, probably as much as 6,000 tons. The drying oil obtained from the seed is stated to be more extensively used in the opium districts, both for lamps and as food, than any other. It is asserted, I know not with what truth, that the use of this oil has a stupifying and injurious effect.

With respect to the *Jatropha oil*, it is now grown to some extent in India; and in the Madras exports a nondescript article, termed "lamp oil seeds," is shipped, occasionally reaching the extent of 5,500 tons per annum. This cannot be the castor oil seeds, which are also known in India as "lamp oil seeds," because these are particularly specified, and are also shipped to the extent of 600 or 700 tons. Dr. Lindley states, that the varnish used by the Chinese for covering boxes, is made by boiling the Jatropha nut oil with oxide of iron.

Niger Seed.—This black seed is the kala teel of Peninsular India, which is sometimes parched and made into sweetmeats, but is usually grown for its oil, which is locally used in cooking. It is the Rametill (*Guizotea olifera*) of other parts of India.

In Ceylon, an oil is obtained from *Hernandia sonora*.

The ground nut is now grown to a considerable extent in India, the seeds being much eaten by the poorer classes, and the oil used for adulterating gingeley oil. The seeds yield about 43 per cent. of a clear, straw-coloured, edible oil. Considerable quantities of the stripped seeds have lately reached London from the East Indies, and been sold as ground-nut kernels.

The new oil seed alluded to by Mr. Archer, the *Psoralia Corylifolia*, bears the Hindoo name of Bawchan, according to Piddington's "Plants of India," and not Bawchee. It is the Bengalee Hakooch.

A small parcel of a new oil seed from Bombay, called Meilch, was recently received in London, which I have not yet been able to identify.

Of the Chinese pea alluded to by Mr. Archer, I have placed samples on the table, and I make the following extract respecting it from my work on Commercial Products. The plant is called teuss, and the dry paste, after the oil is extracted, tanping. Captain H. Biggs, in a communication to the Agricultural and Horticultural Society of India, in 1845, stated that of the esculents a large white pea forms the staple of the trade of Shanghae, or nearly so, to the astonishing amount of two-and-a-half millions sterling. (?) This he gives on the authority of the Rev. Mr. Medhurst, of Shanghae, and Mr. Thom, the British Consul at Ningpo. These peas are ground in a

mill, and then pressed. The oil is used both for eating and burning; more for the latter purpose, however; and the cake, like large Gloucester cheeses, or small grindstones, in circular shape, is distributed about China in every direction, both as food for pigs and buffaloes, and also for manure. Dr. R. Thompson and some other writers have confounded this pea oil with tea oil.

Cotton seed, to the extent of 400 to 500 tons; fenugreck, fennel, coriander, and some other oil seeds, are imported from India in limited quantities.

The import of Indian linseed into Liverpool last year, was 756,950 quarters, and of rape seed, 162,353 quarters, and into London, 254,928 quarters. The ruling prices, per quarter, of these Indian oil seeds in London last month was—

Calcutta rape	67s. to 69s.
Yellow Bombay	69s.
Calcutta teel seed	69s.
Bombay sesame	72s.
Madras gingeley	70s.
Niger	56s.
Poppy	67s.

The mustard seed brought from the East scarcely deserves the name, for it has little or none of the pungent property of the true cultivated Sinapis. The difference in price bespeaks the quality; Dutch brown mustard seed fetches at present 22s. to 23s. the bushel, while the Indian mustard or rape seed is only worth 71s. or 72s. the quarter. I was shown recently by Messrs. Colman, the largest manufacturers of mustard, a beautiful specimen of true Indian mustard seed, imported many years ago, and which would be worth a very high price, but it has gone out of cultivation, and quantity, not quality, has led the growers to raise any kind of weed which furnishes the greatest bulk of seed.

East Indian seed oils have become important articles of importation, and go largely into consumption as substitutes for rape and other oils. The comparative wholesale prices on the 1st January, were, gingeley £51, rape £55, and ground nut, £52 per ton, duty paid. The indiscriminate use of teel, sesame and gingeley for almost one and the same article, leads to much confusion. Rape, surzee, mustard, and gingeley, are also confounded, and mistaken the one for the other by misapplied commercial names.

The total imports of these oil seeds into London last year, was 163,308 quarters, against 64,062 in 1854, and the requirement for our oil crushers is still largely on the increase.

The shipments of linseed last year from the port of Calcutta alone to Great Britain amounted to 1,647,884 Indian maunds, being nearly double the shipments of the previous year, and this was exclusive of the exports from Bombay and Madras. I may also mention the largely increased export of cotton from Calcutta, which last year reached 236,633 maunds, while in 1854 the shipment was but 5,035 maunds. Munjeet, Indian madder root and other staples also show a similar increase.

The question of Agar-Agar and Ceylon moss, has already been discussed, between Mr. Archer and myself, in the pages of the *Pharmaceutical Journal*, vol. 13, p. 355. I was not aware that the former ever came from Ceylon, it being a local commercial product of Singapore and the Eastern Archipelago. Of gum arabic, and the two resins alluded to by Mr. Archer, I have spoken at length in my paper read before the Society in November last, on the "Gums and Resins of Commerce."

My estimated statistics of the average imports of gum arabic, will, I think, be found tolerably correct.

The average deliveries to the trade in London, for the last few years, have been over 1,000 tons, whilst the present stock in London exceeds 1,200 tons, and this is exclusive of the imports at Liverpool, Southampton, and other ports. Senegal is separately specified, but it doubtless does happen that other unrated gums come in mixed with arabic.

In confirmation of the remarks of Mr. Archer on the increasing imports of Nux vomica, I may allude to the evidence I gave on this point when under examination, last year, before the Select Committee on the Adulteration of Food, Drinks, &c., of which our chairman was a member.

The imports of nux vomica into this port alone, in 1855, were 2,376 packages, of about 2 cwt. each, of which 1486 were taken for home use and export, and the present stock is 2114 packages. Of coculus indicus the deliveries last year were 1466 bags, and the stock on hand is 4618 bags, of about 1 cwt. each.

The bitter woods of the West Indies, as far as I know of Jamaica, consist of the Surinam bitter wood (*Quassia amara*); the lofty Jamaica bitter wood, furnishing the quassia chips of commerce, is the *Simaruba officinalis* of Decandolle; the *Picrena excelsa* of Lindley, and the mountain damson, or stave wood, *Simaruba officinalis*. The bitter wood alluded to by Mr. Archer, was a true quassia, and probably consisted of some 23 tons, shipped from Montego-bay, Jamaica, in 1851, of which I make mention in my work. Some years ago, the duty was about £8 or £9 the cwt.; then it was reduced to 10s.; and, as it is now only 1s. the cwt., there is no necessity for any subterfuge in the import. Indeed, this article of the Pharmacopæia is not at all objectionable, for chips of the wood, steeped a short time in water, afford a very wholesome tonic bitter; and a turner in Jamaica forwarded to the recent Paris Exhibition cups made of the wood. In using these, all that is requisite to produce a wholesome bitter morning draught, is to fill them with water at night, and cover them till early morning. The virtue will last in them a very long time.

A small quantity of hyraceum reached the London market about five years ago, and was sought to be brought into notice by some of our chemists as an antispasmodic, but did not succeed. Dr. Pereira took the trouble to analyse and describe it. (See *Pharm. Journal*, Vol. 10, p. 119.) It obtained some repute on the Continent from a laudatory treatise by Dr. Fikentscher, of Erlingen, and as the price it then realised at Hamburgh was 5s. a lb., unless it has lost its popularity there, it ought to have sold at a better price than manure would fetch.

In the paper which I read before the Society in November, 1854, I suggested the desirability of preserving the albumen of eggs, as a glaze and for other purposes, and I am glad to see the hint has been acted upon.

The extensive fishery for, and commerce in, the tripang, or sea slug, in the Eastern seas, is a matter deserving of more attention than has been given to it by our merchants. Ten years ago I gave some full details on the trade in my *Colonial Magazine*, Vol. 10, p. 189.

I would direct notice to some useful products of the horse-chestnut, which I have here in the form of flour, starch, and vermicelli, which, if they can be brought into the market cheap, may become of considerable commercial value, when we consider the abundance of the raw material and the large demand in the manufacturing districts here, as well as on the Continent, for starch for stiffening purposes. In order to obviate the necessity of trenching on food plants for this purpose, the Belgian Government recently offered a premium of £400 for some new starch, which would throw the large quantity of grain and roots now used into the market for human sustenance.

With respect to the marking nut, I may observe that forty-one bags from Cochin were offered at public sale today, but were bought in, no purchaser offering.

Having trespassed rather largely on the time of the meeting, I will now conclude by stating that I have placed on the table, from my own collection, for examination and comparison, samples of our London imports, of some of the articles specified in these remarks, namely:—

African gingeley—a white or mixed variety of seed.
Bombay sesame—a brown seed.
Teel—a black variety.
Meilch seed from Bombay.

Niger seed—the Ramtil of India.
The black and white so-called Indian mustard seeds of commerce.
Sursee seed—a kind of mixed wild Indian rape.
Small Dutch black mustard seed for comparison.
Poppy seed.
Curdee, or safflower seed.
Indian linseeds.
Peas from Shanghae from which oil is extracted.
Castor oil beans.
Myrobalans.
Hickory nuts.
Marking nuts.
Sassafras nuts.
Ground nut, kernels and in the shell.
Various oils from the different Indian seeds named.
Soft and hard Indian wheats recently imported.
Dhurra from the Levant.
Mandioc meal.
Pearl sago.
American cheap prepared isinglass.
Hyraceum.
Quassia simaruba bark, and a few other specimens.

DISCUSSION.

Mr. Keeling (of the firm Keeling and Hunt) was anxious that the meeting should not be deluded by the glowing description of Mr. Archer at the probability of their tables being decked with the delicious tropical fruits, specimens of which were shown and dilated upon that evening. The firm with which he (Mr. Keeling) was connected, had for years been directing their attention to the import of articles of fruit, the great reduction of duty tending materially to lessen their cost; but they had found, upon repeated trials, that the productions of any country, with the exception of articles of the nut species, would not bear a voyage beyond twenty-eight days, either by steam or sailing vessel, without injury to the article. The only countries that could supply England, by reason of the limited distance, were France, Spain, Portugal, the Azores, Malta, Sicily, Belgium, and Holland. The importation of pine apples from the Bahamas was of recent date, and was the extreme limit that could be ventured upon to import so perishable an article, and even that was attended with much risk. The "litchis" and "loquat," as well as other specimens of fruit from the Brazils exhibited by Mr. Archer, were only known in this country by name, small parcels, more from the novelty than the idea of their being introduced as fruits for dessert, being occasionally received in this country; therefore, the meeting must not luxuriate in the idea of any addition being made to the fruit luxuries, the distance from the East Indies, China, Japan, and the Brazils rendering it impracticable. The "loquat," or Nespres Japonica, as it was called by the Portuguese, was grown in Lisbon and the Azores, and resembled the common egg plum of England, but it was half its size. Some specimens had been received, but the flavour was not much admired. During the memorable famine year, his firm received many articles of food used in other countries in order to introduce them into this, and amongst them were two exhibited by Mr. Archer, namely, "Manna Croup" from Russia, and Lentils from Egypt. A controversy then took place with the Custom authorities as to the character of the former, in reference to levying duty, the article being different to what they had seen. Upon analysis it was found to be nothing more than "ground wheat"—manna croup being merely the Russian name for it; and being granulated in appearance resembled Semolina, and might be used as such; but the cost and expense of transit would act almost as a prohibition to any extensive importation to this country. The "Lentils" were in a dried state; they resembled a bean pod, and had a sweet liquorice flavour. The quantity imported was large, and although they were used extensively as an article of food in the East, and were of a nutritive character, they were thoroughly repudiated in this country, and after being tried in every quarter of the United Kingdom had ultimately to be sold, at a great sacrifice, for the purpose of feeding cattle.

Mr. Mechi thought that the papers which had been read were likely to have a very beneficial influence upon British agriculture. The cake made from oleaginous seeds, after the oil had been expressed, had been found of great service. He had used the castor oil cake with considerable advantage for feeding cattle. Mustard cake was also used very largely for manure, and as much as £7 a ton was paid for it for that purpose. In France the poppy was very much cultivated, and it was said that a large portion of the so-called olive oil of France, was, in fact, poppy oil. He had partaken of it and found it a very good substitute, and it was particularly wholesome. The cake that remained, after expressing the oil from the seed, was given to horses, and he (Mr. Mechi) had been told by a postmaster in France, who used it very extensively, that it had the effect of curing a broken-winded horse. He did not know whether the cake had ever been analysed, to ascertain its peculiar properties. The rape cake was very well known. It was clear that a vast quantity of these oleaginous seeds might be imported at very great advantage. As to lentils, or darra, a great quantity was at one time used for feeding pigs, when corn was cheap, but the price had recently become so high, that they could not be used advantageously. He was at a loss to account for the increase in the price, but in proportion to the increase in the price of wheat, so was the increase in the price of lentils.

Mr. R. T. Fauntleroy wished to correct Mr. Archer in one or two of the statements he had incidentally made. First, with respect to the value of ivory imported into Liverpool, he mentioned the price of £1,050 per *ton*. Now, ivory was never sold by the ton, but by the hundredweight, and it varied from £10 to £50 per cwt., according to size and quality; and at the recent public sales in Liverpool, ivory was sold at a price exceeding the highest rates for many years, and one lot only certainly was sold to a French buyer at £51 per cwt. (equal to £1,020 per ton); and he would now, Mr. Fauntleroy heard, be glad to dispose of it at cost price. But the *average* price of this sale was only £37 per cwt., and the average price of the total importations for the past year would be about £26 or £28 per cwt., or little more than *half* the price quoted by Mr. Archer. Again, with respect to seahorse or hippopotamus teeth, the two very fine ones produced were of the *curved* or most valuable description, and the price named, £15 for the pair, was very high—£10 would be nearer the mark. The straight or *upper*-jaw teeth were far less valuable. They were certainly used to a great extent for making artificial teeth, but also for many other purposes. The palm which produced piassava was, he believed, the *Cocos nucifera*, which also yielded the coquilla nut, used for ornamental turning.

Mr. Archer said Mr. Simmonds had expressed disappointment at the limited range of the subjects he (Mr. Archer) had brought before them; but he scarcely knew the regulations of the Society, though he had proportioned the materials to the time allowed. He regretted that more had been expected than he had furnished to them, for he could easily have gone more fully into the subject, having plenty of materials to enable him to do so. The sciences of Economic Botany and Zoology were as yet in an embryo state, and it was necessary to investigate them, in order to determine what were facts and what were not. He found that the most erroneous opinions were often brought forward in so positive a manner, that it was difficult to disbelieve them; but on investigation the truth was discovered, The so-called pine-apple fibre, which had been imported from Manilla, accompanied with what was said to be the leaves of the plant, had been submitted to Sir William Hooker for examination, and he had decided that, although the leaves were those of a plant

which was closely allied to the pine-apple, they were not the leaves of a pine-apple plant. He must also correct a statement made by Mr. Simmonds, to the effect that he (Mr. Archer) was collecting specimens for the British Association, which was not exactly the case. A sum of money had been put at his disposal to enable him to collect as correct an account as possible of the animal, vegetable, and mineral imports into Liverpool during the last five years, so that a scientific as well as statistical work of reference might be formed, which did not exist at the present time, showing the exact amount of articles imported, and the uses to which they were applied. With respect to the question about the produce of the cassava root, both Mr. Simmonds and himself had quoted Dr. Shier; but the statements were so entirely conflicting, that they could only be settled by individuals making reference to the work for themselves. He was perfectly aware of the large amount realised per acre by some of our own roots; but there was a great deal of difference between a plant which occupied two square yards and another which occupied only one square foot. If it was Dr. Shier's statement, that the quantity of starch was 20 per cent., he (Mr. Archer) must withhold his belief until he had looked into the subject more fully. If that really was the proportion of starch in the cassava root, it produced a greater abundance than any other known plant, and ought to be much better known and more extensively used.

Mr. Mechi inquired if Mr. Archer had seen the sugar pod now used for feeding cattle.

Mr. Archer replied that he had; it was the St. John's bread, or "Johannes Bread" of the Germans, and was grown largely in Spain. With respect to the alleged intoxicating properties of Paraguay tea, he quite concurred with Mr. Simmonds in doubting that it possessed such properties. With regard to the hickory nut being a source for oil, he very much doubted whether it would ever be valuable for that purpose, and the application of the pig nut he considered still more impracticable; it was not only as hard as the hickory, but the shell was very much thicker, and the yield of oil would be exceedingly small. Mr. Simmonds had laid particular stress upon mustard seed as being *so-called*, but it was really and truly a mustard seed. Mr. Simmonds objected to it because it had not the flavour of mustard, but our white mustard seed was not the seed ordinarily used; it was the small black mustard seed which yielded the pungent condiment. Mr. Mechi had mentioned the use of the poppy seed in France. It was used to a very large extent, but when it was first introduced, Government had issued a prohibit against its use, from the fear of poisoning the people. It was now commonly used, not only as an edible oil, but for cattle food, and no danger was to be feared from its use. The seeds were much used for sprinkling the peculiar bread used by members of the Hebrew persuasion. Mr. Simmonds had also spoken of "Munjeet or Indian madder root," but Munjeet was one thing and Indian madder another. The first was a long fibrous root, whereas the other was in all respects like the short broken roots of the European madder. He (Mr. Archer) did not think he had endeavoured to lead to the impression that tropical fruits would be introduced largely into this country; but those on the table were all purchasable in the fruiterers' shops at Liverpool. He had much pleasure in hearing what Mr. Keeling had said upon the subject, for it showed that the merchants of Liverpool were much in advance of the very great men in London in receiving importations of those foreign fruits. He did not think that he had, as was stated by Mr. Fauntleroy, misled the meeting as to the value of ivory. He spoke of the specimens he had alluded to as being remarkably fine ones, and the difference between the prices quoted by Mr. Fauntleroy and himself, were too slight to notice (£30 upon a sum of £1050). The sum stated had been received from a merchant who was present at the sale as a purchaser, and it was not mentioned by him as an ordinary case, but as an exceptional one of a remarkable character.

Mr. Keeling said, with regard to the pine-apple fibre alluded to, the leaves of the pine-apple plant, in a particular phase of its growth, could be manufactured into a texture resembling fine cambric.

The Chairman said the article of isinglass had been mentioned in the papers. Dr. Taylor, before a Committee of the House of Commons on the adulteration of food, had given some very curious information upon the subject of isinglass. They were always accustomed to look upon that imported from Russia and Brazil as the finest. But Dr. Taylor had stated that there was a much purer gelatine obtained here at home for every purpose than any that was imported. He also gave evidence respecting *nux vomica*. The importation of it was certainly very largely on the increase, and it would no doubt be very interesting to all to know what was the cause of that increase.

Mr. Simmonds produced a sample of isinglass imported by Mr. Keeling from America.

The Chairman inquired from what source it was derived?

Mr. Keeling believed it was manufactured from fish-bones boiled down. They did not encourage its importation, and looked upon it only as an adulteration.

The Chairman said the isinglass spoken of by Dr. Taylor as being obtainable in this country was procured from the inner skin of animals. Before they brought the proceedings to a close, he thought it would be the pleasure of the meeting that he should express to Mr. Archer and Mr. Simmonds their thanks for the papers they had read.

The Secretary announced that the paper to be read on the evening of Wednesday next, the 5th of March, was "The Progress of English Agriculture during the Last Fifteen Years," by Mr. C. W. Hoskyns. On this occasion H.R.H. Prince Albert, President of the Society, will occupy the chair. The Secretary further stated that *members only* would be admitted on that evening.

EXAMINATION OF MEMBERS OF CLASSES AT ASSOCIATED INSTITUTIONS.

The Council have great pleasure in publishing the subjoined resolution, which was passed at a meeting of the Institution Committee of the Leeds Mechanics' Institution and Literary Society, on Tuesday last. The Council would remind the members that the Leeds Mechanics' Institution has a larger number of subscribers than any in the United Kingdom. The value and importance of this testimony to the Society's proposals for the improvement and development of the education of the working classes, will, therefore, be at once appreciated.

"Resolved—That this Committee cordially approves of the Scheme of Examination laid down by the Council of the Society of Arts, in their *Journal* of date February 22nd, 1856, and recommends that the Scheme, with its details, be communicated to the pupils of the Day and Evening Classes of this Institution, with the offer to pay a sum, not exceeding £10, towards the expenses of sending Four Pupils to London for Examination. The eligibility of such pupils

to be determined by the Head Master of the School, along with the Committee of the Schools and Classes; and that the Examination of the Candidates do take place on Thursday, May 15th."

PAPER MAKING MATERIALS.

Mr. James Withington, who has recently returned from China, after many years' residence there, finding on his arrival the great want of paper-making materials, has recently imported into this country a ton of four different sorts of paper cuttings, of which the particulars are given below.

The Society is indebted to Mr. Bennet Woodcroft, of the Patent Office, for having induced Mr. Withington to send the specimens for distribution to those manufacturers who may care to experiment on them and report to the Society.

Bale No. 1 contains 66 catties of paper cuttings, at 2 dollars 50 cents per picul of 100 catties, or 12 shillings and 6 pence for 133⅓lbs.* or 1⅛ pence per lb.

Bale No. 2 contains 79 catties; No. 3, 76 catties; No. 4, 65 catties; No. 5, 68 catties; No. 6, 69 catties; No. 7, 64 catties; in the whole 4 piculs 21 catties, at 2 dollars per picul, or 10 shillings for 133⅓ lbs., or 3⅜ farthings per lb.

Bale No. 8 contains 94 catties; No. 9, 94 catties; No. 10, 88 catties; and No. 11, 84 catties; in the whole 3 piculs 60 catties, at one dollar 30 cents per picul, or 6 shillings and 6 pence for 133⅓ lbs. or 2$\frac{17}{20}$ farthings per lb.

The remaining five bales, Nos. 12 to 16, contain 10 bundles at 60 cents., or 3 shillings per bundle. These bales weigh on an average 60 lbs. each, or 1⅓ pence per pound.

Freight, insurance, and charges are to be added to the above. Freight is estimated at £5 per ton, and charges and insurance at 10 shillings per ton.

The contents of bales Nos. 1 to 11, inclusive, are cuttings of paper; and it is uncertain what quantities could be obtained; but, owing to the number of books made in China and the large amount of paper used for parcels, a few hundred tons could be had at any time.

The material contained in bales Nos. 12 to 16 could be obtained in any quantity. This manufacture is used very largely for making plaster for walls, and applied externally, being used for mixing with lime, the same as hair is employed in England; it is also used for tying up coarse parcels.

ON THE MANUFACTURE OF THE PERMANENT WAY OF RAILWAYS AS AN INTEGRAL BRANCH OF OUR IRON INDUSTRY.

By W. Bridges Adams.

The iron industry of Great Britain is emphatically indigenous, by the juxta-position of coal, ironstone, lime, climate, strong men, and cheap transit; a combination not yet known to exist in the same perfection in any other part of the world; a combination that will not fail till our coal and iron shall be consumed; and which, possibly, while our coal lasts, may induce the profitable import of iron ores from other regions.

All processes tending to increase our manufactured products in iron, by adding labour and machinery to the men and iron pigs, must be a gain to ironmasters as well as to the general community; and the more these operations can be rendered complete in themselves, without the need of secondary arts, the more perfect will they become.

Railways and iron ships are the two great staple consumers of iron. Ships are made, finished, and sold to all parts of the world; and it has long appeared to the writer a desirable thing that the permanent way of railways should obtain a like condition of completeness. With this view the writer pursued the investigation of the subject.

Reasoning from the rolling machines to the road, the writer came to the conclusion that the rails were only a part of the machine, forming together a tool of transit, and that a perfect locomotive with an imperfect rail was like a perfect lathe-head with an imperfect bed to it. The first and most evident defect was the total absence of any efficient mode of connecting the rails together at the joints. A railroad is better than a common road, simply by its harder and more even surface. But with a loose joint at every fifteen feet, it is quite possible for the rail to be a worse road than the macadam, *quoad* the loads running over it. The first object, therefore, was how best to patch their joints, and form the rails into continuous bars.

Rails may be generally divided into two classes,—those applied directly to the sleepers, and those applied through the agency of chairs—in other words, those forming their own base and those requiring an additional base. What is called the bridge-rail is of the former class, and also what is called the American or contractor's rail. In manufacture, the base of the bridge rail may be conveniently made to any width desirable. The base of the foot rail is limited by the process of manufacture to about 4 inches. The early foot rails were from 2½in. to 3in. in height, by 4in. in width, of continuous base. The earlier bridge rails were from 3in. to 3½in. in height, by 6in. in width, of continuous base.

The single T-rails and double I-rails were from 4½in. to 5in. in height, with an intervallic base of 9in. to 11in., formed by cast chairs or shoes, which, however, raise the rail to 7in. above the sleeper.

The bridge and foot rails were mostly used with longitudinal timber sleepers, the T-rails with transverse sleepers.

By reason of the disproportion existing between the engines and rails, the deflecting caused the bridge rails to crush into the timber, and the T-rails to hammer into the chairs, producing destructive wear and costly maintenance of way, to remedy which many kinds of patchwork contrivances were devised.

The writer's first piece of patchwork was the contrivance now known far and wide as the "Fish-joint," *i.e.*, to apply iron fishes in the side channels of the double I-rails on either side of the joint, supporting the whole by a pair of chairs about 6 inches apart, with a view to make the rails a continuous bar, while permitting expansion and contraction. This patch has since been made an inferior patch, by the subsequent process of bolting to and through the rails for the sake of a lessened outlay at the cost of a heavier maintenance.

This fishing process was so unsatisfactory, that at a subsequent period the writer was led to consider the practicability of a better method, for the amount of existing rails was so considerable that many years had to elapse before they would be worn out. The patch of the fish was a patch in connection with the existing system of chairs, that is to say, the defects inherent in the chair system were palliated by the fish. The question then arose,—Was the chair essential to the proper support of the rail, or could any better support be adopted? The chair was evidently defective in two ways. It elevated the rail two inches above the sleeper, and from want of sufficiently firm connection to the rail, caused the destruction of the lower table. The method of improvement soon suggested itself. Allowing the rails to bear direct on the sleeper, and placing on each side an angle-formed bracket, or knee, fitting the side channels of the rails, and bolted thereto, and bolted also to the sleeper, precisely as the deck beam of a

* Note.—The dollar is worth 5s. sterling at the present time; the picul is 133⅓ lbs. weight; and the catty is $\frac{1}{100}$th part of a picul.

ship is secured to the timber by knees, gave a very practical result. The rails are lowered two inches, an efficient foot is firmly secured to them, loose keys are dispensed with, the bearing surface on the sleeper is increased, the lower table is saved from damage, and while the quantity of the cast metal at each joint bracket does not exceed the weight of the ordinary joint chair more than 6lbs. each, the intermediate brackets are each 10lbs. less than the intermediate chairs. By this process the double I-rails, being saved from damage, are really reversible. This is really a new system of cross sleeper-way, consisting of six types or forms,—rail, joint bracket, intermediate bracket, bolt, spike, and sleeper. This bracket system will be known in France as "*Le Système Console.*"

Amongst other things in the construction of a permanent way, not the least important is to lessen the number of parts or types. A fished cross-sleeper road consists of a rail, a chair, a wood key, a spike, a sleeper, a fish, and a fish bolt, in all seven parts. A bridge rail longitudinal road consists of a rail, a longitudinal sleeper, a fastening bolt, a joint plate, a joint bolt, an under joint plate, a cross transom, and a tie bolt; in all eight parts.

It is obviously a most difficult thing so to combine these parts as to constitute them an integral whole to resist vertical and lateral and compound vertical and lateral compression, the chief objects for which railways are preferred to macadam roads.

The double T-rail has integrally more vertical strength than the bridge rail, by reason of greater depth; it has less lateral strength and diagonal strength by reason of its lessened width.

The wood keys and the wood sleepers, it should be remembered, in no way help the integral strength of the rail. They are merely a packing or cushion, to keep the rails in position on the ballast, and the ballast has obviously no cohesive power to resist the crushing power of a locomotive wheel. If the rail be not sufficiently strong in itself to distribute the weight over a sufficient surface of ballast, no attempt to harden the ballast artificially, by packing or ramming by human labour, can remedy the evil.

The only remedy is to increase the width and depth of the rail bars, till they be absolutely inflexible, either vertically or laterally, beneath the rolling loads.

In the usual mode of applying rails by supporting them on their lower edges, this involves a considerable difficulty, as the base must be widened in proportion to the height. In the bridge rail the extreme height is about 4in. to 6in. base, the ordinary double T is 7in. height to about 11in. base; and even these proportions are insufficient to prevent the rocking of the rails by the lateral blows of the engine wheels.

Thus, if a bridge rail were required to be 7in. in vertical depth, to prevent deflection, it would require nearly 12in. base to prevent side rocking, and the vertical strength must be greatly increased to prevent vertical crushing.

Improvement in this direction seemed hopeless, and, therefore, the writer determined to begin at the beginning, setting forth the essential principles and then working them out mechanically. The principles he deemed essential are as follows:—

Firstly. That the depth vertically be sufficient to prevent all deflection by the rolling load, which must form the datum for calculation.

Secondly. That the width be sufficient to prevent all lateral deflection.

Thirdly. That the bearing surface in the ballast be sufficient to prevent any displacement by the rolling load.

Fourthly. That the joints be so formed as to constitute each line of rails a firm and a continuous base, with provision for expansion and contraction.

Fifthly. That the head of the rail, constituting the tread of the wheel, be the minimum of height above the bearing surface on the ballast.

Sixthly. That the head of the rail be of solid form, and not overhanging, in order to prevent crushing by the rolling of the wheels.

Seventhly. That in case of a double-headed rail, formed for the purpose of reversal, the arrangement be such as not to damage the lower head.

Eightly. That such a form be chosen as will give the maximum of strength with the minimum of weight of metal.

Ninthly. That the structure be such as to permit of such an amount of elasticity as to prevent destructive rigidity.

Tenthly. That there be no brittle or rotting material in the structure.

Eleventhly. That the parts or types of form be as few as possible.

Twelfthly. That the structure be such that any ironmaster can produce it complete in any required quantity, as a rope-maker produces cordage, and without requiring any skilled labour to apply it.

Thirteenthly. That the packing and repair be easy and accessible.

Fourteenthly. That the drainage be simple.

Fifteenthly. That it maintained its position in the ballast without tendency to displacement.

Practically, the writer found that for ordinary work it was desirable to have bars not less than 7 inches in total depth. To apply such bars in the ordinary method of supporting them on sleepers below, would have required a very strong and heavy vertical rib, with a very large base. This was out of the question.

The obvious method was to place the bearing flanges as close as possible to the head of the rail. The flange of the wheel being $1\frac{1}{4}$in. in depth, a clearance of $\frac{5}{8}$ths will give $1\frac{7}{8}$in. The thickness of flange being $\frac{5}{8}$in. will give a total of $2\frac{1}{2}$in. from the head of the rail to the bearing surface on the ballast, leaving $4\frac{1}{2}$in. of keel below the bearing surface, to induce lateral steadiness. The breadth of bearing on the ballast being 13 inches, the depth of keel on the ballast $4\frac{1}{2}$, and the elevation of the head above the ballast only $2\frac{1}{2}$, it is obvious that the minimum tendency to rock is attained, with the maximum of vertical and lateral stiffness in the rail itself, and a solid nearly square head.

The first idea was to roll the rail whole, but in such case the convenience of rolling large and heavy rails would consume more metal than is essential for strength. As the vertical rib is practically suspended by the horizontal flanges, and does not act as a prop, it is clear that the thickness of the vertical rib need only be just so much as will firmly connect the upper and lower tables or heads together. About $\frac{3}{8}$ths of an inch in thickness will practically suffice for this, and therefore the rail may be comparatively light, while possessing the strongest possible form of head for the wheels to run on. This process leaves two side channels, exactly adapted for the reception of two continuous angle brackets, or wings, with a vertical web of about $3\frac{1}{2}$ inches, and a horizontal web of about $6\frac{1}{2}$ inches, fulfilling all the requisite conditions.

These brackets afford yet another advantage. With the solid rail, it is essential to connect the rails together by joint plates of one kind or other, analogous to fishing. But the brackets can be arranged so as to break joint with the rails and with each other, in a mode that two solids will support every joint, analogous to the fibres of hemp in joining a rope. The two brackets and the rail, forming as it were three stands, are bolted together by bolts through all three, at every 18 inches, and this, in addition to the strength as a girder, forms practically a tensile cable, which will carry the rolling loads in case of the supporting ballast being accidentally worked away.

These rails and brackets thus forming a continuous support, and being self-sustaining in the ballast, require no sleepers to sustain them. For the purpose of de-

termining rather than maintaining the gauge of way, cross tie-bars are provided, formed of plain bar iron, with the edge vertical, and with a short crank at each end to take any bolt connecting the brackets to the rails. On a straight line a tie-bar to every 9 feet run will be ample. On curves any number required may be applied, as every bolt hole in the rails and brackets will afford the needful fastening without any especial preparation. In laying out curves the rails will easily bend laterally, but not so the angle brackets. This can be provided for by preparing the brackets at the iron works, moulding them while heated from the rolls either by passing them through three rollers, or pressing in a cast iron trough. For a particular occasion, it would be practicable to produce the required curvature on the ground by hammering on one edge to expand it, and indenting upwards and downwards the opposite bracket.

As the brackets are continuous, the shoulders of the rails may form nearly a square channel, without being weakened, as would be the case with the ordinary double I-rails. And thus these brackets will retain their position without any strain in the bolts as is the case with those used for fishes, where the strain is excessive owing to the obtuseness of the angle of the rail shoulder. And as the bolts are below the brackets, the ballast forms a matrix to keep them tight.

As the bearing of the brackets is on the surface of the ballast, the quantity of ballast required will be only one-half that required for the ordinary cross sleeper road, where the bearing is ten to twelve inches below the surface; and another advantage follows. The raising or packing the rails is all surface work, whereas, on the ordinary road, the upper surface of the ballast must be removed in order to get at the lower. And it is, moreover, a much simpler process to apply ballast of equal consistence to a continuous longitudinal bearing than to the discontinuous bearings of cross sleepers. A deflecting rail especially requires equal packing, and it is rarely that two men can pack alike.

This suspended girder system is a multiple of only four parts or types—rail, bracket, bolt, and tie bar—in contradistinction to the seven and eight parts or types of the ordinary systems; and, taking a length of 18 feet single line, it will be found that the ordinary double I system has sixty-eight pieces, and the bridge rail system seventy-two pieces, to set against forty-six pieces on the girder system.

There remains the question of drainage. The object of providing drainage is, that surface water from the rain is apt to percolate and get below the sleepers or bearing surface. If coarse broken stone be the medium of support to the sleepers, such water can get away, but if a loamy gravel be used it will concrete together, become impervious to water, and form a series of transverse ponds some ten inches below the surface in which the sleepers will pump up and down by the pressure of the trains gradually loosening the whole system.

With the suspended girder system the bearing is on he surface, and the central keel below is covered in from action of rain. Supposing a foot of ballast on clay, the action of the rail bearers is to press out the water laterally between the non-porous surfaces above and below, just as a sponge may be squeezed dry between two plates.

As a practical people we are dissatisfied with any mere theoretic proof. A theory may be true in itself, but it may be grounded on false or insufficient data, which practice only can discover.

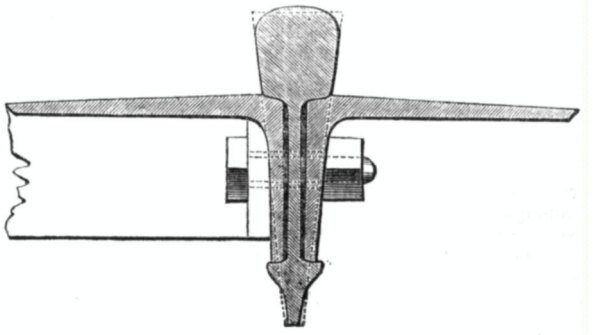
The two systems have been some time in use, and are in increasing use. On the Great Northern and the South-Western, the bracket system may be seen as applied to the double I-rails and cross sleepers, with satisfactory results. At King's-cross, on the Great Northern, the suspended girder system may be seen, after three months' daily use, under what is called the heaviest work in England, the up-coal-line laid on an upward incline of 1 in 110 on a slight curve, by the side of a wet clay hill. It is the first that was made; is very imperfectly prepared; and the frequent coal trains that run over it average about 300 tons gross. The rails give no sensations of hardness, nor any indications of unequal resistance. They have been submitted to the experimental proof of digging away the ballast, and leaving the rail as a bridge for a length of six feet, and then passing the heavy bank engine over the gap at the intersection of the joints.

This first sample was laid by men who had never before seen the rails, and the first trains ran over it without packing the ballast previously, but merely putting it in with the shovel.

This system, then, does fulfil the conditions required in a permanent way, and puts into the hands of our ironmasters the means of supplying it complete from their own works without any chance of error in laying down. It can be made in assorted sizes, to suit any kind of traffic, and can be laid down by any unskilled labourers, whether black men in Africa or red men in America. Engineers or merchants can thus order their permanent way as they would merchant bars, by the ton or by the mile. The system, with varieties, is equally suited for the heaviest locomotive work, for the light traffic of farms, for portable military rails, or for mineral lines.

The comparative cost, taking saving of ballast and laying down into account, will be found not to exceed the ordinary cross timber line, and in many cases it will be less. The maintenance in labour will not be one-half, and the saving in the renewals, with the difference of value in the old materials to be sold, together with interest in savings, will be equivalent to the reproduction of the line in the course of 21 years.

The following wood-cut, for which we are indebted to the kindness of the editor of the *Engineer*, shows a transverse section of the rail and brackets, with a portion of a tie bar, the rail being about 65lbs. per yard, and possessing double the vertical strength of an ordinary rail of the same weight. It is made with a single head, to save weight of iron on a line where the traffic is not frequent, and the rail will not wear out so rapidly as to require reversal.



Home Correspondence.

PATENT GRANTS.

Sir,—In the granting of a patent, the interference of lawyers of the Crown is, indeed, "worse than useless." It was thought so, I know, at the time the Patent Amendment Act was passed. Mr. Woodcroft's Indexes afford full information as to patents already granted; and a museum at the Great Seal Patent Office would show the various attempts made to produce a given effect. Patentees ought to pay all the expenses of that office; but beyond this it seems unreasonable to tax a man for his ingenuity.

I am, Sir, yours, &c.,
M. S. BENTHAM.

PATENT REFORM.

Sir,—I have not the advantage of being a member of the Committee on the Patent Office Surplus Fund question, and as I do not cease to be as much interested in all that regards patent reform as I formerly was, may I be allowed space in the Society's *Journal* for a few suggestions on this subject.

First, then, I would suggest (although I am opposed to grants to scientific men out of the *special* funds of the Patent Office, as I formerly stated in the *Journal*, conceiving as I do that they ought to be remunerated out of the *general* public funds), yet I consider that grants for scientific and practical inquiries and experiments, and payments to men of science for such purposes, would be perfectly legitimate; and further I may state that, to my knowledge, most inventors would support any arrangement for those objects.

Secondly. That a list of scientific and practical men should be made up at the Patent Office, and one or more should be chosen by the law officers, or the courts of law, as the case may be, to inquire, report, and give evidence in patent investigations and litigations, the expenses and remuneration of these official scientific witnesses to come out of the Patent Fund, and no extra charge to be incurred by the litigants, unless, indeed, the court thinks it right to specially mulct any one in the amount of such charges.

Thirdly. That the Government dues on patents be reduced, or rather I would prefer that patents for *seven years* be granted at *half the present charges*, as well as the 14 years' patents, as at present, these short patents to be subject to the same chance of renewal by the Privy Council as those for the longer term. I have many minor suggestions to offer, but I will not increase the length of this communication further than to say, that I think the chances of patent reform would be increased by getting the President and Vice President of the Board of Trade amongst the Commissioners of Patents; and further, that whatever my ideas of the competency of the law officers, as arbiters of patent grants, may be, yet I must protest against their being considered *worse than useless*, as I know of many instances in which their criticisms of the provisional specifications presented to them, have been of great advantage to applicants for patents.

I am, Sir, obediently yours,
F. W. CAMPIN.

156, Strand, Feb. 18th, 1856.

IRISH DECIMAL COINS.

Sir,—In your last number I mentioned the existence of a series of decimal coins, founded on the dollar, retaining the penny as the fiftieth part. I now wish to draw your readers' attention to the existence in Ireland of a decimal coinage formed on the decimal multiples of the penny.

The Bank of Ireland, urged forward by the great want and the depreciated state of the few small silver coins in Ireland, under the sanction of several Acts of Parliament, (Stat. 45 G. III., c. 42; 48 G. III., c. 31; 53 G. III., c. 106; 56 G. III., c. 68,) issued coins (tokens) of the value of 5, 10, 30, and 60 pence Irish. These coins were ordered to be received on payment of the public revenue in Ireland; and to prevent them and the tokens of the Bank of England being re-melted and coined into other silver tokens, such as the shilling and sixpenny tokens issued chiefly in the West of England, about 1816, several Acts of Parliament were passed as (52 G. III., c. 157; 53 G. III., c. 114; 54 G. III., c. 4,) declaring all other tokens illegal; they were even continued as legal tender by the Act (56 G. III., c. 68), at the new silver coinage in 1816, but they were, perhaps, called in by the proclamation of the 1st of March, 1817, though they are not specially mentioned in it, or probably they remained current until the currency of the Great Britain and Ireland were assimilated, on the 27th of June, 1827. The larger coin, of sixty-pence, is exactly like the Bank of England "five shilling piece or dollar," with a new reverse Britannia, and the inscription being replaced by a figure of Hibernia, "the Bank of Ireland and six shillings." The other tokens are inscribed "Bank Tokens, five (10 or xxx.) pence Irish." The dates of those I have seen are, 1804, 1805, 1808, and 1813. I recollect their being in circulation in England, mixed with our current silver money, and called Irish shilling or tenpennies. These coins certainly offered the Irish an opportunity to adopt a decimal system of account, but I have never heard that they availed themselves of it.

It has been often stated that no country that ever had a decimal coinage has resumed their old non-decimal system; a statement only to be explained by the want of knowledge of the subject even as regards Great Britain.

The decimal coins struck for the Sierra Leone Company, (which was established, I find, to encourage trade to Africa, and more especially to find a home for the Negro soldiers who had entered into the king's service in the unhappy American war), have, I believe, entirely fallen out of use in the colony, and we know that the Irish keep their accounts in pounds, shillings, and pence.

The extension of the decimal system on the continent of Europe is almost entirely owing to the desire which Napoleon had, by the means of coin, to perpetuate his personal glory, and also to satisfy the vanity and universalism so prominently exhibited by the French nation at the time of the Revolution. For this purpose the French emperor caried with him a mint, and as soon as a country submitted to his arms, he "reformed" the coinage, imposing on it the French decimal system, and it is curious to see the uniformity and pertinacity with which this idea was carried out. At Baden, in 1808, he made it an article in a secret treaty, that a coin should be struck with his head as Emperor of the Bund; a five-franc was struck (and is valued at 20 pounds sterling), indeed, it is believed that the Grand Duke only struck a single example.—(See *Bonneville, Ency.*, t. i., f. 3.) The system certainly took root in several countries, but then we must recollect that many of the difficulties experienced at its first introduction had passed away, and that at the peace in 1815 it would have been only the recurrence of fresh difficulties and confusion to have returned to the old system.

It was introduced into Venice in 1800; Piedmont (Le Gaule Subalpine) in 1802, and here he named the piece of 20 francs the "Marengo," in memory of the battle of that name, which reduced the Piedmontese to French subjugation; in Switzerland (Helvetic Republic), in 1803; Holland, in 1806, Holland (including Belgium) being a part of France from 1810 to 1814; Westphalia, in 1807, Joseph Buonaparte having coined gold and silver pieces in 1808, 1809, 1810, and 1812. Yet this country at the peace returned to its old mixed currency; so that when we speak of the French system being adopted by Belgium, Holland, Switzerland, Sardinia, &c., referring to the latter period of this adoption, we should consider under what circumstances it had been previously introduced.

J. E. GRAY.

Feb. 15, 1855.

P.S.—I find, on further research, that the United States coined "cents" in 1791, with General Washington's head on them, but I have seen no silver earlier than the date mentioned.

CARPETS FOR THE PEOPLE.

Sir,—With reference to the late discussion on carpets, will you allow me to remark, that, although flatness in design and subordination in colour are, to my mind, essentials to a well-chosen carpet for a richly-furnished drawing-room, yet for the poor, who have no such fantasie, brightness in design appears to me very desirable, viz., something in itself bright and cheering to look at.

In a sanitary point of view I think Kidderminster carpets most objectionable; they are very porous, and after

three months' wear the floor beneath will, in towns, be found covered with a thick layer of dust. For the working classes, I think the best carpeting is the best thick felt. These carpets are very easily kept clean, and are quite impervious to dust.

Yours truly,
GEORGE WYLD, M.D.

Proceedings of Institutions.

London Domestic Mission Reading Room.—The annual meeting of this branch of the Mission was held lately, the Rev. W. Vidler in the chair. The room was hung with drawings, banners, and devices, and the chairman, referring to one of the former, a picture of Stonehenge, drew a brief but happy sketch of the progress of the nation, from the period when this structure was reared, to the raising of the Crystal Palace of our own day. He contrasted the products of art and industry displayed in the Paris and Sydenham Exhibitions, giving the palm decidedly to the former; and this fact, he thought, would teach Englishmen a lesson they much needed—humility—and quicken in them a desire to emulate superior excellence. He took the presence of the members there that night as indicating a sense of their own deficiencies, and as evincing also a desire for self-improvement. In these days of many Institutions, no one, having the will to improve, need suffer from the want long. The great evil was, that young people took to knowledge by fits and starts. He begged of them to keep steadily to whatever they undertook, doing it well, and making study an art, as well as art a study. The Secretary mentioned the steady progress the reading-room continued to make; its numbers were still increasing; its income exceeded its expenditure; new books were constantly being added to the library, and more volumes were daily circulated. He spoke of the various classes, elementary and advanced, held in connection with the reading-room, and of the fresh impetus given to them by the proposed examinations about to be held by the Society of Arts. This, he had no doubt, would help to systematise their studies, and direct them to a clearer and better defined object. He spoke hopefully of the improved taste for reading observable amongst the members, and was disposed to look leniently on the prevailing taste for novel reading, deeming it the infant stage of study—the sweet-stuff of literature—and the desire for which would be outgrown by the speedy wish for more solid and wholesome food. He suggested whether a sick benefit society, and a saving fund could not be established in connection with the Institution, to save persons from putting by their money at public houses. About a dozen other members gave short addresses or read extracts from favourite authors. Various pieces of choral and ballad music enlivened the meeting during the evening, and the chairman gave some interesting experiments in the art of electro-plating, showing its advantage over the old plan of washing and gilding. The meeting concluded with the anthem, "Now Pray we for our Country."

Salford.—Recently, the second annual meeting of the members of the Mechanics' Institution, was held in the large room within the building, Great George-street, Salford. Mr. G. Teale, deputy-chairman for the past year, presided. Mr. John Urquhart, the honorary secretary, read the annual report of the directors, which stated that, although the pecuniary position was not so satisfactory as the directors could wish, yet, notwithstanding the great depression in trade, and the dearness of provisions, which had necessitated all classes curtailing their expenditure, the number of members on the books had not decreased, but had been somewhat augmented. Monthly tickets of membership had recently been issued, which it was hoped would induce more members to join. A mortgage of £500 had been effected on the building, to meet the demands on the building fund, and the new directors are recommended to exert themselves for the liquidation of the debt. During the year, 92 volumes had been contributed to the library, which contains 1,850 volumes, and has also the advantage of the itinerating library of the Lancashire and Cheshire Institutional Association. The number of volumes issued to the members during the past year was 2,113 volumes. The news and reading room were well supplied. The president of the institution, E. R. Langworthy, Esq., has promised to provide funds for annual prizes to the various classes. Much attention had been paid to the classes, and their present condition was, on the whole, considered highly satisfactory. The boys' school, under Mr. Angell, has been attended with gratifying success; the attendance at the girls' school had not been so satisfactory, although under an able female conductor. The particulars of the evening classes showed encouraging results. The balance of liabilities on the Institution (exclusive of the mortgage debt of £500) was £139 2s. 3½d. It was hoped that the debt would be liquidated, and that the Institution would be placed in a self-supporting position. The report and the treasurer's statement of accounts having been adopted, Mr. D. Chadwick, the treasurer, adverted to the importance and value of the classes for promoting elementary education, and expressed his belief that next year they would be able to establish a class for natural philosophy and chemistry. He suggested the organisation of a number of social meetings for rational and agreeable entertainment, as a means of bringing the members together; and a piano, which had been purchased by subscription for the singing class, would be an important auxiliary on such occasions.—Directors for the ensuing year were elected; and thanks were voted to the retiring directors, to Mr. Chadwick, to Mr. Urquhart, to Mr. Robertson, who conducts the mathematical class gratuitously; and to the chairman; and the proceedings then terminated.

MEETINGS FOR THE ENSUING WEEK.

Mon. Royal Inst., 2, General Monthly Meeting.
London Inst., 7, Mr. John Ella, "On Music, Vocal and Instrumental."
Chemical, 8.
Entomological, 8.

Tues. Royal Inst., 3, Prof. Huxley, "On Physiology and Comparative Anatomy."
Civil Engineers, 8, Mr. W. K. Hall, "On the Causes of the Explosion of Steam-Boilers."
Linnæan, 8.
Pathological, 8.

Wed. London Inst., 3, Mr. R. Grant, "On Elementary Astronomy."
Society of Arts, 8, *for Members only*, Mr. C. W. Hoskyns, "The Progress of English Agriculture during the last Fifteen Years."
Geological, 8, 1. Mr. R. N. Rubidge, "Notes on the Geology of some parts of South Africa." 2. Mr. J. W. Salter, "On Fossil Remains in the Cambrian Rocks of the Longmynd." 3. Mr. R. Harkness, "On the Lowest Sedimentary Rocks of the South of Scotland."
Pharmaceutical, 8.

Thurs. Royal Inst., 3, Professor Tyndall, "On Light."
Zoological, 3.
London Inst., 7, Mr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Photographic, 8.
Royal, 8½.

Fri. Botanical, 8.
Royal Inst., 8½, Sir Charles Lyell, "On the Successive Changes of the Temple of Serapis."

Sat. London Inst., 3, Mr. E. W. Brayley, "On Geology."
Royal Inst., 3, Professor Odling, "On Organic Chemistry."
Royal Botanic, 3¾.
Medical, 5, Anniversary.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 9th and 11th February, 1856.

Par. No.
Agricultural Statistics (Ireland) (Live Stock)—Return.
Agricultural Statistics (Ireland) (Tillage)—Return.
Fisheries (Ireland)—Report of the Commissioners.

Session 1854-55.

511. Railways—Return.

Delivered on 12th February, 1856.
20. Ordnance—Supplemental Estimate, 1855-56.
24. Turkish Loan—Return.
17. Revenue Departments—Estimates.
6. Bills—Local Dues on Shipping, &c.
16. Bills—Court of Chancery (Ireland).
27. Bills—Joint Stock Banks (Scotland).
Wrecks and Casualties—Report to the Board of Trade.

SESSION, 1854-55.
505. Health of the Navy—Statistical Reports.
Delivered on 14th February, 1856.
10. Postal Communication with the Australian Colonies—Treasury Minute.
12. Petty Sessions Clerks (Ireland)—Return.
21. Navy Promotions—Return.
22. Naval Cadets—Return.
25. New Palace (Westminster)—Treasury Minutes respecting Sir C. Barry's Claims.
26. Bullion (Bank of England)—Return.
25. Bills—Medical Profession.
29. Bills—Contractors' Disqualification Removal.
Delivered on 15th February, 1856.
9. District Lunatic Asylums (Ireland)—Treasury Minute.
27. Postal, &c., Communication with Ireland—Treasury Minute.
10. Bill—Prisons (Ireland).
Delivered on 16th and 18th February, 1856.
34. Coinage—Account.
36. Emigration—Return.
17. Bills—Court of Common Law (Ireland).
19. Bills—Juries (Ireland).
31. Bills—Municipal Reform (Scotland).
26. Bills—Church Rates Abolition.
34. Bills—Commons Inclosure.
35. Bills—Drainage Advances Acts Amendment.
36. Bills—Turnpike Trusts Arrangements.
37. Bills—Civil Service Superannuation.
Copyholds—14th Report of the Commissioners.
Inclosure Commission—11th Annual Report.
Tithe Commission—Report.
Army (Crimea)—Copies of Letters by the Earls of Lucan and Cardigan.
Delivered on the 19th February, 1856.
19. Army Estimates.
28. Ramsgate Harbour—Copy of Report, &c.
30. Bill—Justices of the Peace Qualification.
Delivered on the 20th February, 1856.
30. Public Debt—Account.
31. Russian Dutch Loan—Account.
32. Greek Loan—Account.
33. Sardinian Loan—Account.
40. Appointments (Dockyards)—Return.
41. Local Acts—(1, Carmarthen and Cardigan Railway; 2, Cork and Youghal Railway; 3, Deeping Fen Drainage; 4, Dundee Harbour; 5, Ely Tidal Harbour and Railway; 6, North Shields and Tynemouth Dock; 7, Yarmouth and Haddiscoe Railway); Admiralty Reports.
24. Bills—Ecclesiastical Courts Jurisdiction.
38. Bills—Delamere Forest.
39. Bills—Charitable Uses (Amended).
Foreign Office (Examination of Persons—Correspondence.
Australia (Discovery of Gold)—Further Papers.
Delivered on 21st February, 1856.
29. Salt Provisions—Return.
35. Army Commissions—Return.
38. Army Clothing—Return.
39. Trade and Navigation—Accounts (31st December, 1855).
38. Bill—Delamere Forest (Amended), (a corrected copy).
Delivered on 22nd February, 1856.
37. Bank Notes—Copies of Correspondence, and of Order in Council.
49. Admiralty Charts—Return.
4. Bills—Judgments Execution, &c.
28. Bills—Juvenile Convict Prison (Ireland).
Factories—Reports of the Inspectors (31st October, 1855).
Delivered on 23rd and 25th February, 1856.
43. Board of Fisheries (Scotland)—Copies of Reports and Treasury Minutes.
46. Burmese War—Return.
47. Reformatories—Return.
48. East India Judicial Establishments, &c.—Copy of Letters.
52. Military Savings Banks (Crimea)—Copy of General Order.
57. Committee of Selection—1st Report.
54. Corpus Christi College, Oxford—Copy of Regulations and Ordinances.
55. Exeter College, Oxford—Copy of Regulations and Ordinances.
56. Lincoln College, Oxford—Copy of Regulations and Ordinances.
42. Bills—Reformatory Schools (Scotland).
41. Bills—Commissioners of Supply (Scotland).
Delivered on 26th February, 1856.
42. Metropolitan Police—Accounts.
45. Army Commissions—Return.
50. Ecclesiastical Commission (Ireland)—Report.
58. Danish Succession—Copy of the Protocol of Warsaw.
61. Education—Capitation Money—Return.
63. East India (Nawab of Surat)—Copy of an Act.
44. Bill—Aldershot Camp.
Delivered on 27th February, 1856.
391 (1). Trade and Navigation Accounts (31st January, 1856).
23. Bills—Dissenters' Marriages.
32. Bills—Dwellings for Labouring Classes (Ireland).
48. Bills—Carlisle Canonries.
51. Bills—Vice-President of Committee of Council on Education.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette February 15th*, 1856.]

Dated 30th January, 1856.

254. John Lee Stevens, London—Improvements in doors or apparatus for regulating the supply of air to steam boiler and other flues and furnaces.
255. John Gretton, Burton-upon-Trent—Improvements in brewing.

Dated 31st January, 1856.

256. John Stokes, Birmingham—Improvements in fog signals.
257. Henry Holford and Mark Mason, Newton Iron Works, Hyde, Chester—Improvements in machinery or apparatus for compressing metals and for manufacturing all kinds of metallic rivets, bolts, or similar articles.
258. Aubin Emile Coullard-Descos, Paris—Improvements in consuming smoke.
259. James Mash, Manchester—Improvements in working the valves of steam engines.
260. George Napier, Bath-street, Glasgow—Improvements in apparatus for raising, lowering, and suspending boats from ships.
261. Henry Tylor, New Bond-street—Improved joint, applicable to cots, bedsteads, and other frames in metal.
262. John Kinniburgh, Renfrew—Improvements in moulding or shaping metals.
263. Joseph Harrison and John Oddie, Blackburn—Improvements in machines for winding yarn or thread on to spools or bobbins.
264. Thomas Burdett Turton and John Root, Sheaf and Spring Works, Sheffield—Improvements in buffer, bearing, and draw springs.
265. Henry Render, Manchester—Improved lubricating material.
266. Frederick Kersey, 5, Laurie-terrace, St. George's-road, Southwark—Improvement in the manufacture of drain pipes.
267. George Hallen Cottam and Henry Richard Cottam, Old St. Pancras-road—Improvements in folding bedsteads and chairs.
268. John Barker Anderson, East-hill, Wandsworth—Improvements in the manufacture of soap, parts of which improvements are applicable to preparing materials for the purposes of illumination, and also for the purposes of lubrication.
269. Thomas Hurst, Tanner-street, Barking—Improvements in the connecting of the rails or metals generally used on railways.
270. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in gas burners, and in regulating the combustion of gas. (A communication.)

Dated 1st February, 1856.

272. Matthew Ker, 8, Cumberland-market—A machine for sweeping carpeted and other floors.
274. Francis Preston, Manchester—Improvements in machinery for shaping and rolling metal.
276. Charles Robert Moate, 65, Old Broad-street—Improvement in securing and sustaining the rails of railways.
278. William Dray, King William-street—Improved cartridge-box and pouch.
280. Francis Best Fawcett, Kidderminster—Improvements in the manufacture of carpets.
282. George Norgate Hooper and William Hooper, Haymarket—Improvements in springs for carriages, and for the cushions of carriages, chairs, mattrasses, beds, and other similar articles.
284. George Duckett, 5, Norfolk-terrace, Westbourne-grove West, Bayswater—Improvements in carts and vans.
286. Charles Catherine Joubert, Rue de Moscow, and Leon André Bordier, Rue de la Ferme des Mathurins, Paris—Improvements in motive-power engines.
288. John O'Meara Beamish, Trafalgar-road, Old Kent-road—Improvement in the manufacture of morocco leather.

Dated 2nd February, 1856.

290. John Rock Day, Birmingham—Improved door lock and latch.
292. Benjamin Burleigh, Great Northern Railway, King's-cross—Improvements in certain parts of the permanent way of railways.
294. William Goodman, 6, Canning-place, Leicester—Improvements in machinery for producing knit or looped fabrics.

Dated 4th February, 1856.

298. Ralph Waller, Manchester—Improvements in preparing cotton and other fibrous materials.
302. Matthew Whiting, junr., Manning-street, Bermondsey—Improvements in preparing for and in tanning hides and skins.
304. Nathan Agar, Upper Ebury-street, Pimlico—Improvements in connecting spindles of locks and latches with their knobs and handles.
306. Thomas Mills, Leicester—Improvements in machinery for the manufacture of looped fabrics.

Dated 5th February, 1856.

308. Frans Victor Oscar Hyckert, Paris—Improvements in heating.
310. Michael Leopold Parnell, 283, Strand—Improvement in the construction of locks.
312. Francis Montgomery Jennings, Cork—Improvements in bleaching vegetable fibres.
316. Thomas Williams, Clerkenwell—Improvements in omnibuses.

Dated 6th February, 1856.

318. George Napier, Bath-street, and John Miller, Cavendish-street, Glasgow—Improvements in the mode of driving and in applying screw propellers to the propulsion of vessels.
320. John Dodgeon, Burnley, and James Wilson Bateson, Rawtenstall—Improvements in looms for weaving.
322. John Inshaw, Birmingham—Improved pressure guage.
324. Charles Victor de Sauty, St. Mary's-terrace, Walworth—The prevention of the leading or fouling of fire-arms.
326. Franklin Prestage, Wylye, Heytesbury—Improvements in locomotive engines.
328. Charles Frederick Philipp Funcke, Herdecke, Westphalia—Improvements in tanning skins and hides.

Dated 7th February, 1856.

330. Richard Bleasdale, Rochdale—Improvements in the machines for spinning called throstles.
334. Henry Berlette, Boulogne-sur-Mer—Improved apparatus for roasting coffee.

INVENTION WITH COMPLETE SPECIFICATION FILED.

345. John Wallace Duncan, Grove-end-road, St. John's-wood—Improvements in or connected with apparatus for the generation and application of steam for impelling purposes.—9th February, 1856.

[*From Gazette February 22nd*, 1856.]

Dated 17th January, 1856.

156. Samuel Ratcliffe Carrington, Stockport—Improvements in the manufacture of hats, and in machinery or apparatus connected therewith.

Dated 1st February, 1856.

271. Allan Macpherson, Brussels—Improvements in obtaining and applying motive power. (A communication.)
273. Edward Schischkar, Halifax—Improvements in dyeing and colouring wools, hairs, silks, yarns, and textile fabrics made of the same materials either wholly or partially.
275. George Holcroft, Joseph Smith, and Thomas Holcroft, Manchester—Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.
279. Andrew Lamb and John Ronalds, Southampton—Improvement in the construction of iron ships, boats, and other similar structures.
281. Henry Bestwick and Joseph Bury, Manchester—Improvements in cocks, taps, or valves.
283. James Timmins Chance, Birmingham—Improvements in furnaces used for flattening glass.
285. Auguste Eugène Dannequin, Rue de l'Echiquier, Paris—Improvements in caoutchouc or any other waterproof garments.
287. Benjamin Franklin Miller, New York—Improvements in ventilators for chimneys and other purposes.

WEEKLY LIST OF PATENTS SEALED.

Sealed February 15th, 1856.

1861. Charles Rowley.
1873. Edward Heys.
1875. Robert Crawford.
1897. Dupont de Bussac.
1909. Joseph Gilbert Martien.
1949. Richard Archibald Brooman.
1986. Edward Greene Jones.
2018. Charles Pryse and Paul Cashmore.
2044. Jean Panet.
2141. Etienne Laporte.
2357. Henry Woodrow.
2493. Samuel Cunliffe Lister.
2508. Charles Marie Pouillet.
2512. Henry John Betjemann.
2581. George Tomlinson Bousfield.
2671. Charles Rice.
2673. Charles Rice.
2812. Thomas Rickett.
2864. Hiram Hyde.
2880. Dundas Smith Porteous.

Sealed February 19th, 1856.

1891. John Cornes.
1893. James Orange.
1895. Edward Field.
1898. Charles Van den Bergh.
1906. Charles Claus.
1911. William Lynall Thomas.
1922. John Avery.
1924. John Avery.
1928. Charles Frederick Stansbury.
1930. Adam Hall Hardy and Jacob Hardy Fordoff.
1993. George Hearnden Golding.
1994. George Hearnden Golding and Thomas Paine.
2004. Augustin Morel.
2100. Auguste Edouard Loradoux Bellford.
2204. William Ramscar.
2442. Auguste Edouard Loradoux Bellford.
2656. Denis Jonquet.
2830. William Henry Newman.

Sealed February 22nd, 1856.

1901. Jacob J. Lownds.
1903. Jules Theodore Alexandre Zinkernagel.
1905. Wright Jones.
1915. William Wood.
1923. John Avery.
1925. John Avery.
1927. Charles Frederick Stansbury.
1929. Eugene Carless.
1945. Auguste Edouard Loradoux Bellford.
1961. John Juckes.
2043. Eugène Grenet, jun.
2047. Edmund Sharpe.
2073. Jean Pierre Garbai.
2091. John Gray, M.D.
2171. Joseph Mitchell.
2189. Franz Uchatius.
2593. Joseph Denton.
2637. Charles Tennant Dunlop.
2697. Alfred Vincent Newton.
2753. Rudolph Bodmer.
2775. William Norton.
2779. Robert Adam Whytlaw.
2801. Alfred Vincent Newton.

Sealed February 26th, 1856.

1933. Celse Eugène Capron.
1935. Thomas Alexander Cooling.
1936. Charles Humfrey, jun.
1938. James Smith.
1942. Charles Humfrey, jun.
1948. Edward Newman Fourdrinier.
1966. Rudolph Schramm.
1980. William Smith.
1982. Alfred Heaven.
1996. William Woodcock, Thomas Blackburn, and James Smalley.
2020. William Armand Gilbee.
2026. John Stewart.
2102. Richard Archibald Brooman.
2124. Ursurer Joseph Brasseur.
2150. Thomas Deakin.
2166. Robert Robey and George Lamb Scott.
2726. William Foot.
2792. Jacques Elidat de Malbec.

Patents on which the Third Year's Stamp Duty has been Paid.

February 11th.

396. William Blissett Whitton and George Samuel Whitton.
1195. Moses Poole.

February 12th.

437. Wright Jones.
557. Thomas Wells Cross.
666. William King Westly.

February 13th.

381. Peter Armand le Comte de Fontaine Moreau.

February 14th.

413. James Murphy.
418. Thomas Clark Ogden and William Gibson.

February 15th.

390. Benjamin Greening.
407. John George Perry.
421. Charles Watt and Hugh Burgess.
476. John Grist.

February 18th.

434. Charles Nightingale.

February 19th.

456. Edwin Stanley Brookes and Joseph Black, and George Stevenson and William Jones.

February 20th.

438. Samuel Rodgers Samuels and Robert Sands.
445. Thomas Bell and Richard Chrimes.
467. William Johnson.
469. Thomas De la Rue.
677. George Ross.

February 23rd.

482. John George Taylor.
491. Lord Berriedale.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3810	February 15.	Travelling Bottle and Glass	P. and F. Schafer	12, Brewer-street, Golden-square.
3811	February 18.	Fishing Winch Reel with Check	Frederick Allies	Worcester.
3812	February 27.	Improved Cap for Travelling Bags	Seth Dixon and Edmund Eyres	17, Savoy-street, Strand.